EARLY DETECTION OF CHRONIC KIDNEY DISEASE USING MACHINE LEARNING

TEAM ID : PNT2022TMID48329

A PROJECT REPORT

Submitted by

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AND

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1. INTRODUCTION

Project Overview

This article objects to predict Chronic Kidney Disease based on full features and important features of CKD dataset. 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. For this perspective, Chronic Kidney Disease prediction has been discussed in this article.. The important feature selection technique was also applied to the dataset. For each classifier, the results have been computed based on (i) full features, (ii) correlation-based feature selection, (iii) Wrapper method feature selection, (iv) Least absolute shrinkage and selection operator regression, (v) synthetic minority over-sampling technique with least absolute shrinkage and selection operator regression selected features, (vi) synthetic minority oversampling technique with full features. Along with machine learning models one deep neural network has been applied on the same dataset and it has been noted that deep neural network achieved the highest accuracy of 99.6%.

Purpose

This research article primarily aims to predict whether a person has Chronic Kidney Disease or not. In this perception, seven different machine learning classifiers were applied on the dataset. All the algorithms were running with both full features and selected features. SMOTE was used for over sampling and all the results were recorded. All the machine learning model results were also compared with one deep neural network algorithm. Deep learning neural network was used with two hidden layers.

2. LITERATURE SURVEY

Existing Problem

SURVEY 1 : AUTHORS: Himanshu Kriplani, Bhumi Patel and Sudipta Roy

TITLE : Prediction of Chronic Kidney Diseases Using Deep Artificial Neural Network Technique.

METHODS : This project presents a method to detect the chronic kidney disease and methodologies to diagnose chronic kidney disease is a challenging problem which can reduce the cost of treatment. We studied 224 records of chronic kidney disease available on the UCI machine learning repository named chronic kidney diseases dating back to 2015. Our proposed method is based on deep neural network which predicts the presence or absence of chronic kidney disease with an accuracy of 97%. Compared to other available algorithms, the model we built shows better results which is implemented using the cross-validation technique to keep the model safe from over fitting. This automatic chronic kidney disease treatment helps reduce the kidney damage progression, but for this chronic kidney disease detection at initial stage is necessary.

SURVEY 2 :

AUTHORS : Hongquan Peng , Haibin Zhu , Chi WaAo Ieong , Tao Tao , Tsung Yang Tsai , Zhi Liu

TITLE : A two-stage neural network prediction of chronic kidney disease

METHODS : This paper presents a method to detect chronic kidney disease (CKD) plays a pivotal role in early diagnosis and treatment. Measured glomerular filtration rate (mGFR) is considered the benchmark indicator in measuring the kidney function. However, due to the high resource cost of measuring mGFR, it is usually approximated by the estimated glomerular filtration rate, underscoring an urgent need for more precise and stable approaches. With the introduction of novel machine learning methodologies, prediction performance is shown to be significantly improved across all available data, but the performance is still limited because of the lack of models in dealing with ultra-high dimensional datasets. This study aims to provide a two-stage neural network approach for prediction of GFR and to suggest some other useful biomarkers obtained from the blood metabolites in measuring GFR. It is a composite of feature shrinkage and neural network when the number of features is much larger than the number of training samples. The results show that the proposed method outperforms the existing ones, such as convolution neural network and direct deep neural network.

SURVEY 3 :

AUTHORS : Deepak K N , Adhwaidh P S , Akshay P D , Athira K S , Jisna Jayan

TITLE : Chronic Kidney Disease Prediction system using Machine Learning

METHODS : This paper reviews and analyzes the Chronic kidney disease (CKD) is a global health issue that causes a high rate of morbidity and mortality, as well as the onset of additional diseases. Because there are no clear symptoms in the early stages of CKD, people frequently miss it. Early identification of CKD allows patients to obtain timely treatment to slow the disease's progression. Due to their rapid and precise recognition capabilities, machine learning models can successfully assist doctors in achieving this goal. We propose a machine learning framework for diagnosing CKD in this paper. The CKD data set was taken from kaggle, which has a substantial number of missing values. We employ multiple machine learning methods such as DT, SVM, and DNN to analyze data from CKD patients with 21 characteristics and 400 records. The dataset is preprocessed by filling in missing data and normalizing it. To increase accuracy and save training time, the most relevant features from the dataset are chosen. Image processing and letter recognition are used to automatically input the attributes.

References

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Cushman, L. A. McClure, B. B. Newsome, and G. Howard, ‘ Albuminuria and racial disparities in the risk for ESRD,’ J. Amer. Soc. Nephrol., vol. 22, no. 9, pp. 1721–1728, Aug. 2011.

3. M. K. Haroun, ‘ Risk factors for chronic kidney disease: A prospective study of 23,534 men and women in Washington County, Maryland,’ J. Amer. Soc. Nephrol., vol. 14, no. 11, pp. 2934–2941, Nov. 20.

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5. W. Mula-Abed, K. A. Rasadi, and D. Al-Riyami, ‘ Estimated glomerular filtration rate (eGFR): A serum creatinine-based test for the detection of chronic kidney disease and its impact on clinical practice,’ Oman Med. J., vol. 27, no. 4, pp. 339–340, 2012.

6. A. S. Levey, D. Cattran, A. Friedman, W. G. Miller, J. Sedor, K. Tuttle, B. Kasiske, and T. Hostetter, ‘ Proteinuria as a surrogate outcome in CKD: Report of a scientific workshop sponsored by the national kidney foundation and the US food and drug administration,’ Amer. J. Kidney Diseases, vol. 54, no. 2, pp. 205–226, Aug. 2009.

Problem Statement Definition

To identify and manage patients who have early stages of chronic kidney disease may slow or prevent the progression to end stage kidney disease and reduce cardiovascular complications caused due to diabetes and high blood.

Who does the problem affect?

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

What are the boundaries of the problem?

A disease in GFR may also be a marker of kidney disease and precedes the onset of kidney failure . Below 60 ml/min/1.73 m , the prevalence of complications of CKD Increases , as does the risk of cardiovascular disease . Albuminuria (ACR ≥ 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?

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. Some of the common health problems caused by kidney disease include gout, anemia, bone disease, heart disease and fluid buildup.

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 and high blood pressure.

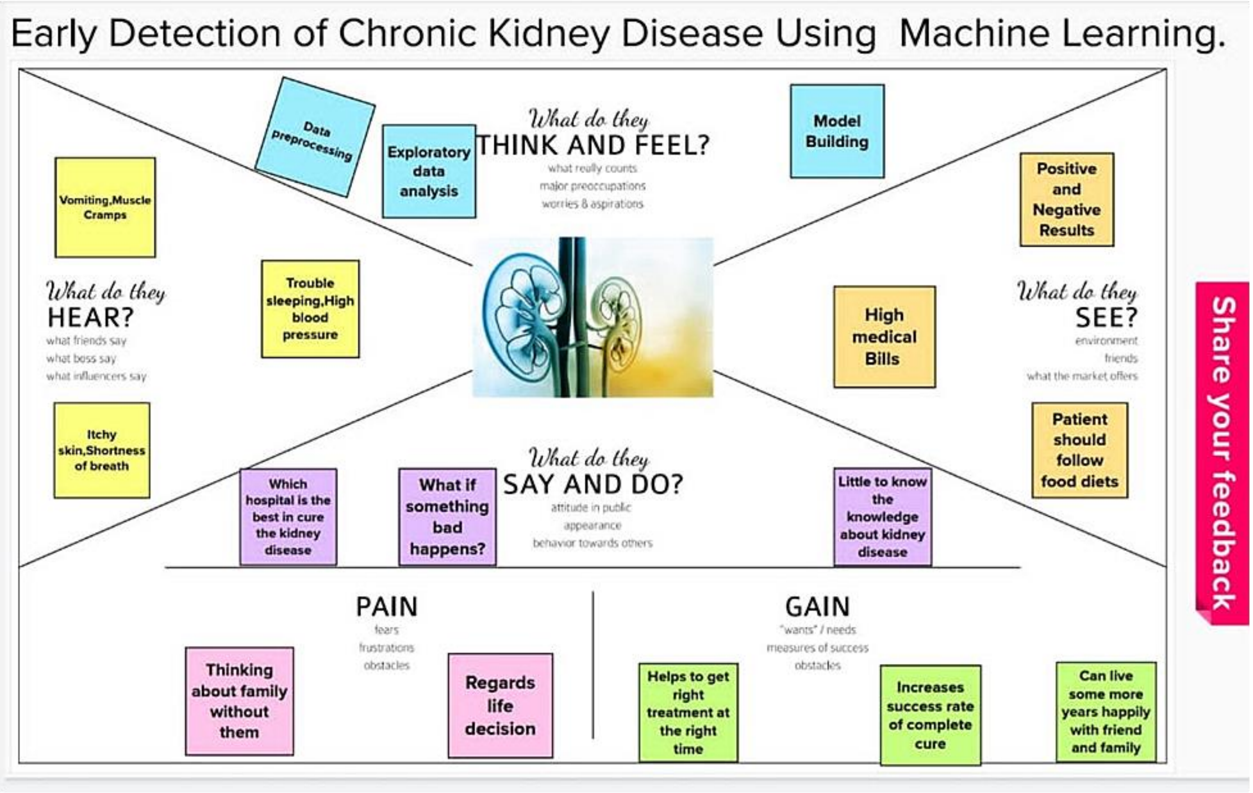
Why is it important that we fix the problem?

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.

3. IDEATION & PROPOSED SOLUTION

Empathy Map Canvas



Early Detection of Chronic Kidney Disease Using Machine Learning.

What do they THINK AND FEEL?

what really counts
major preoccupations
worries & aspirations

Data preprocessing

Exploratory data analysis

Model Building

What do they HEAR?

what friends say
what boss say
what influencers say

Vomiting,Muscle Cramps

Trouble sleeping,High blood pressure

Itchy skin,Shortness of breath

What do they SEE?

environment
friends
what the market offers

Positive and Negative Results

High medical Bills

Patient should follow food diets

What do they SAY AND DO?

attitude in public
appearance
behavior towards others

Which hospital is the best in cure the kidney disease

What if something bad happens?

Little to know the knowledge about kidney disease

PAIN

fears
frustrations
obstacles

Thinking about family without them

Regards life decision

GAIN

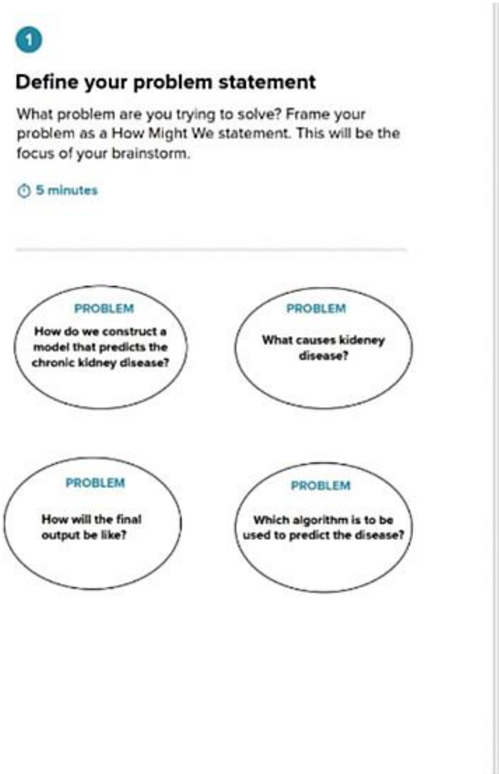
"wants" / needs
measures of success
obstacles

Helps to get right treatment at the right time

Increases success rate of complete cure

Can live some more years happily with friend and family

Ideation and Brainstorming:



1

Define your problem statement

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

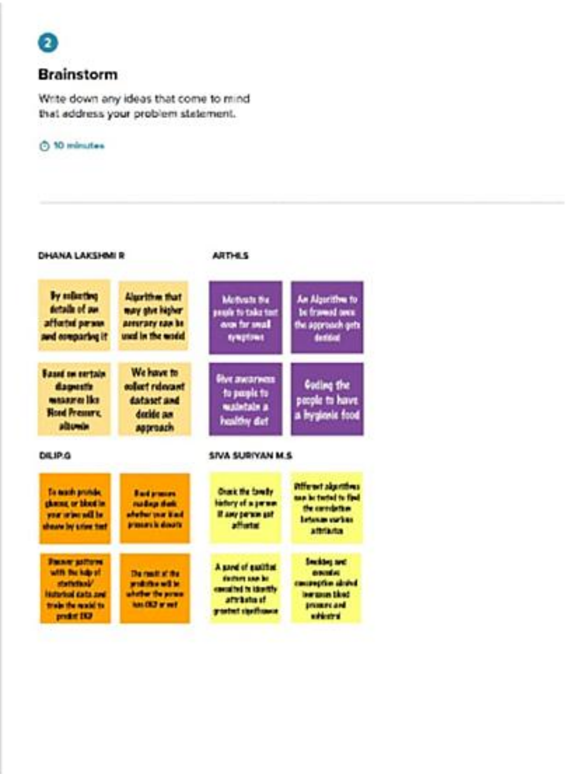
5 minutes

PROBLEM
How do we construct a model that predicts the chronic kidney disease?

PROBLEM
What causes kideney disease?

PROBLEM
How will the final output be like?

PROBLEM
Which algorithm is to be used to predict the disease?



2

Brainstorm

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

10 minutes

DHANA LAKSHMI R

- By collecting details of an affected person and comparing it
- Algorithm that may give higher accuracy can be used in the model
- Based on certain diagnostic measures like Blood Pressure, albumin
- We have to collect relevant dataset and decide an approach

ARTHI.S

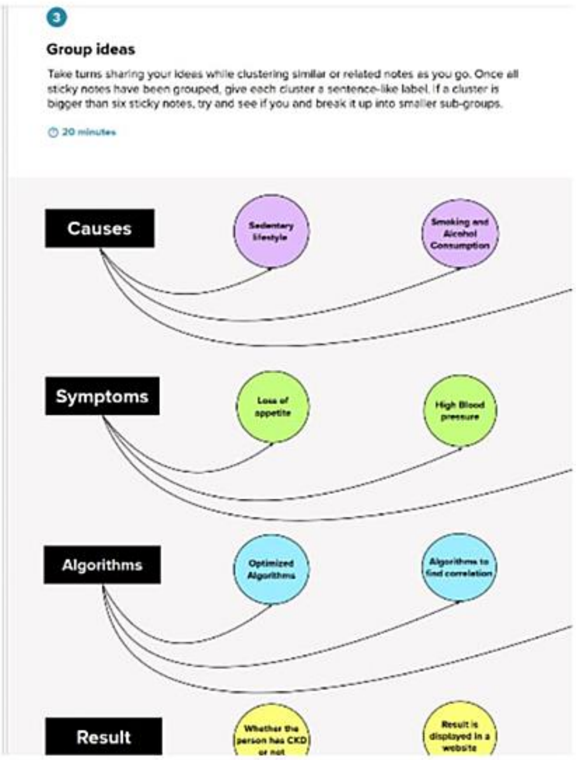
- Motivate the people to take test even for small symptoms
- An Algorithm to be framed once the approach gets decided
- Give awareness to people to maintain a healthy diet
- Guiding the people to have a hygienic food

DILIP.G

- To check protein, glucose, or blood in your urine will be shown by urine test
- Blood pressure readings check whether your blood pressure is [illegible]
- Discover patterns with the help of statistical/ historical data and train the model to predict CKD
- The result of the prediction will be whether the person has CKD or not

SIVA SURIYAN M.S

- Check the family history of a person if any person got affected
- Different algorithms can be tested to find the correlation between various attributes
- A panel of qualified doctors can be consulted to identify attributes of greatest significance
- Smoking and excessive consumption alcohol increases blood pressure and cholestrol



3

Group ideas

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

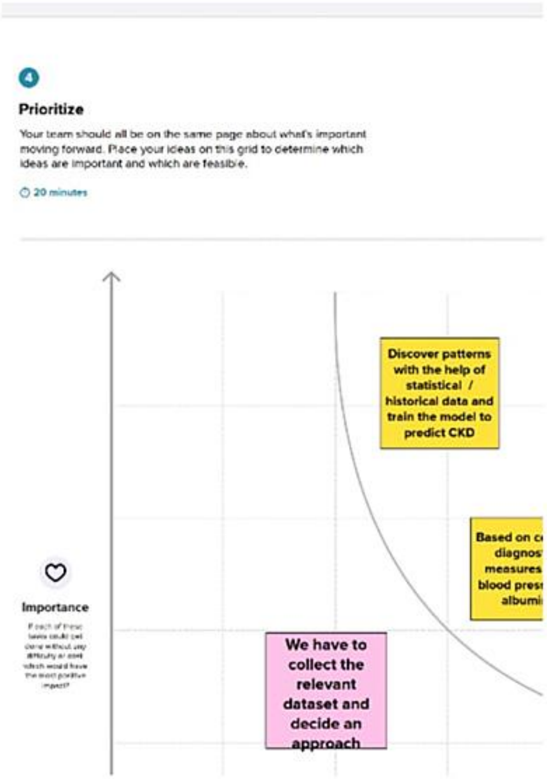
20 minutes

Causes
Sedentary lifestyle
Smoking and Alcohol Consumption

Symptoms
Loss of appetite
High Blood pressure

Algorithms
Optimized Algorithms
Algorithms to find correlation

Result
Whether the person has CKD or not
Result is displayed in a website



4

Prioritize

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

20 minutes

Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

Discover patterns with the help of statistical / historical data and train the model to predict CKD

Based on c
diagnos
measures
blood pres
albumi

We have to collect the relevant dataset and decide an approach

Proposed Solution

Problem Statement

Chronic Kidney Disease is a major concern for the global health care system. Chronic Kidney Disease 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 CKD. Recent research suggest that some of the negative outcomes can be avoided with early identification and treatment.

Feasibility of idea

To predict the early onset of CKD, three Machine Learning techniques are used: ->Random Forest, Decision Tree, Support Vector Machines. Using these techniques, each algorithm's effectiveness is evaluated and the prediction of how many people have been affected by CKD is identified.

Novelty

The renal patient is recognized by undertaking two primary tests.

->A Blood Test to determine Glomerular FilterationRate(GFR).

->A Urine Test to determine Albumin.

Social Impact

As people don’t undergo the general test of their health, early detection of CKD is not identified. This creates a great social impact of not being aware of CKD. As a result of this many people are getting affected by CKD.

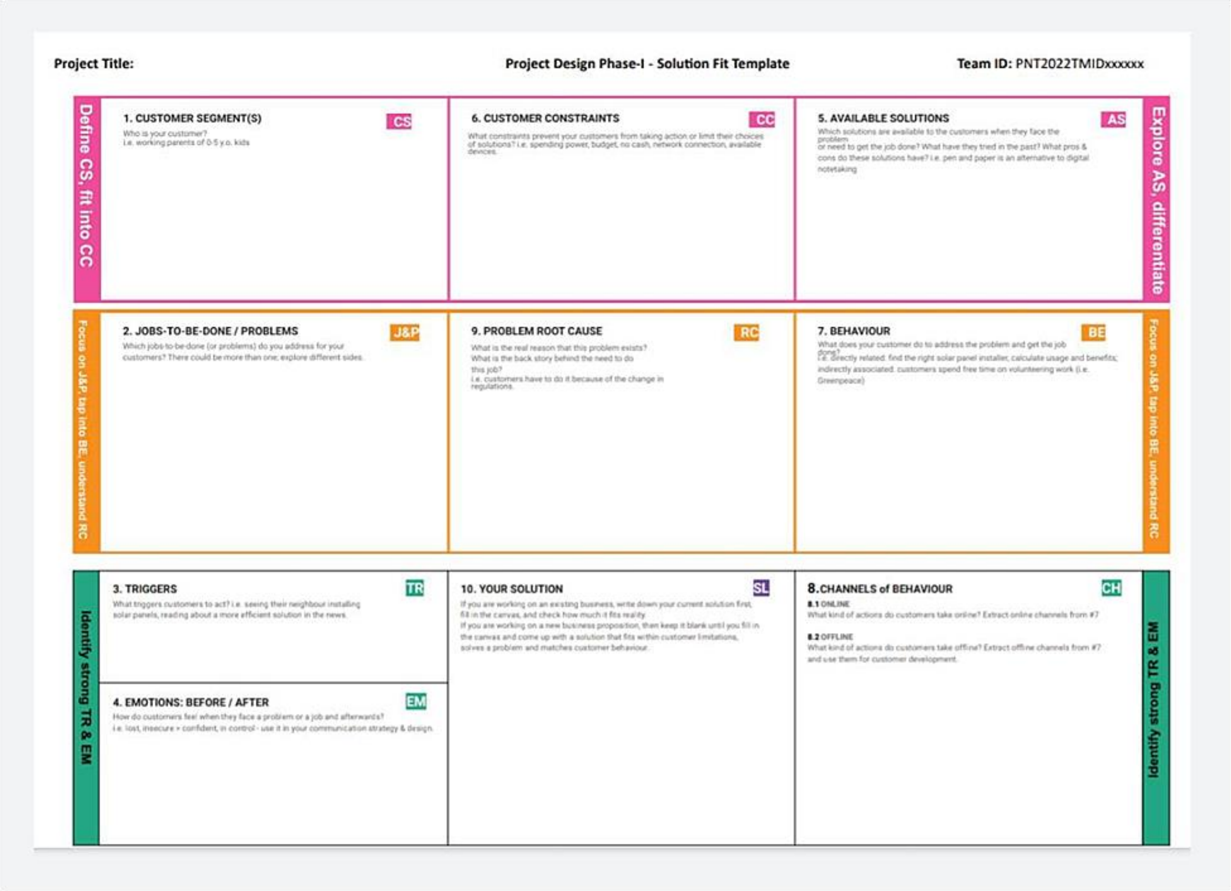
Business Model

The widespread use of Machine Learning of predicting the CKD in the Medical Industries promotes medical innovation, lowers medical expenses, and improves medical quality. In order to cure the CKD patients, the hospitals have been gaining business profit in recovering the patients.

Scalability of solution

This Chronic Kidney Disease have been spreading widely now a days. Early prediction of CKD using Machine Learning that is more efficient to analyze the disease so that it can be cured on time.

Problem Solution Fit



Project Title: **Project Design Phase-I - Solution Fit Template** **Team ID:** PNT2022TMIDxxxxxx

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

6. CUSTOMER CONSTRAINTS CC

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.

5. AVAILABLE SOLUTIONS AS

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 pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

Explore AS, differentiate

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

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

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

Identify strong TR & EM

3. TRIGGERS TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

4. EMOTIONS: BEFORE / AFTER EM

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.

10. YOUR SOLUTION SL

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.

8.CHANNELS of BEHAVIOUR CH

8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

Identify strong TR & EM

4. REQUIREMENTS ANALYSIS

Functional Requirements

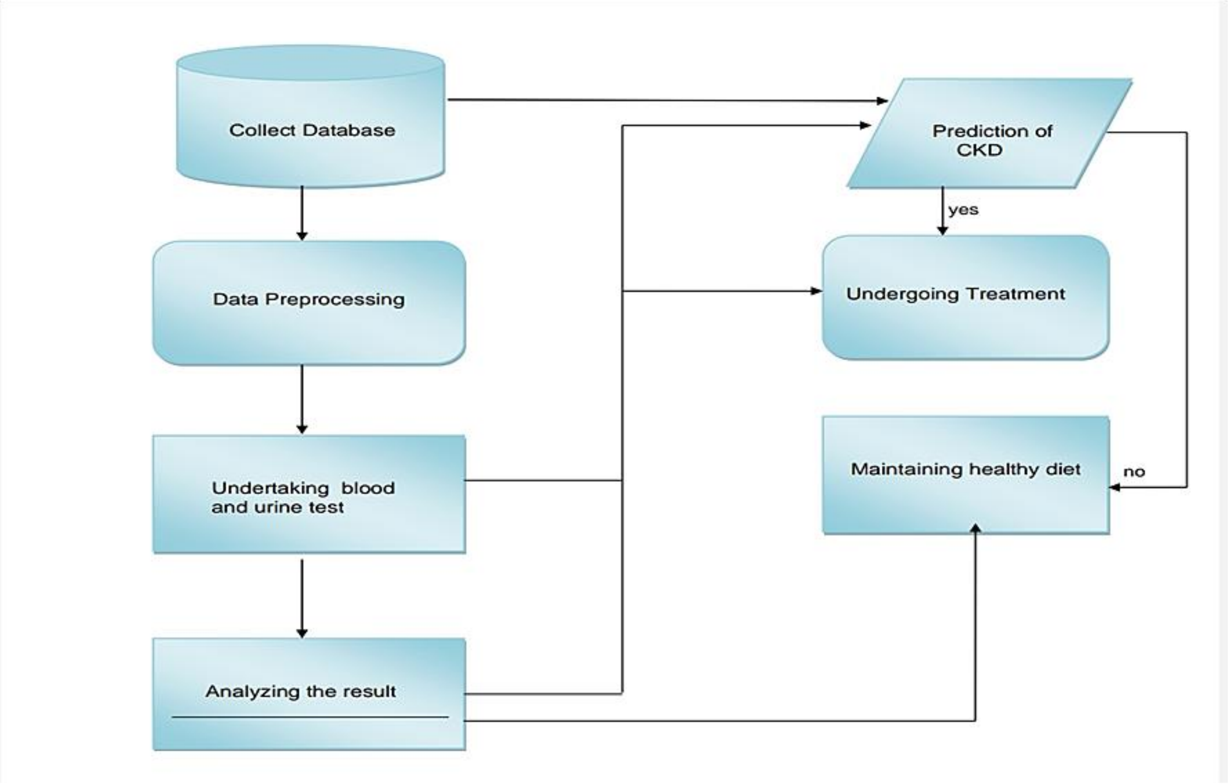
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR 1	User Page	Users can go to home pag
FR 2	Details	Users can know more details about the CKD.
FR 3	User Requirements	Store past records Generate report for presence of CKD Diagnostic remedies for symptoms
FR 4	User Entry	Input form for pre-diagnostic test results
FR 5	Business Requirements	Quick diagnosis for CKD
FR 6	User Feedback	Allows users to submit feedback

Non- Functional Requirements

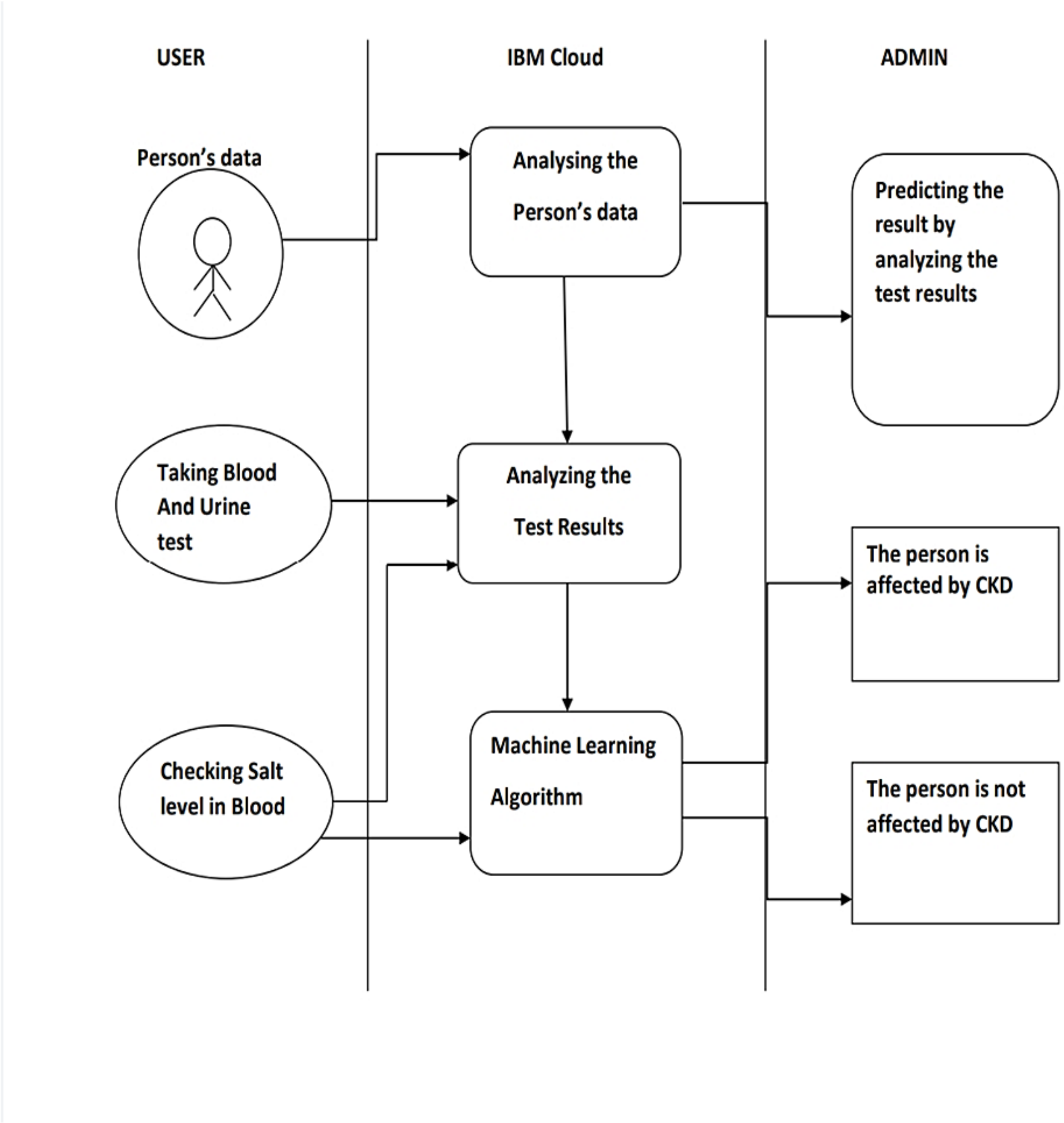
FR NO.	Non-Functional Requirement	Description
NFR - 1	Usability	Simple user-friendly interface for communication
NFR - 2	Security	Safeguard the details shared by users and maintain confidentiality
NFR - 3	Reliability	Diagnosis based on probability predicted by ML model must be reliable
NFR - 4	Performance	Reduction in overall time taken for diagnosis
NFR - 5	Availability	Available at any time to users from various places
NFR - 6	Scalability	Needs to support numerous users at once

5. PROJECT DESIGN

Data Flow Diagrams



Solution & Technical Architecture


USER
IBM Cloud
ADMIN
Person's data
Analysing the Person's data
Predicting the result by analyzing the test results
Taking Blood And Urine test
Analyzing the Test Results
The person is affected by CKD
Checking Salt level in Blood
Machine Learning Algorithm
The person is not affected by CKD

User Stories

Create Home Page

As a user, I can collect the database of patients.

Preprocessing

As a user, I can preprocess the data from the database.

Testing

As a user, I can make the patients undergo two kinds of test (urine and blood test)

Analysis

As a user, I can analyse the test results

Prediction

As a user, I can predict CKD with the test results

Recovering Process

As a user, I can make the affected patients to take treatment

Awareness

As a user, I can advise the patients to maintain a healthy diet plan.

6. PROJECT PLANNING & SCHEDULING

Sprint Planning & Estimation

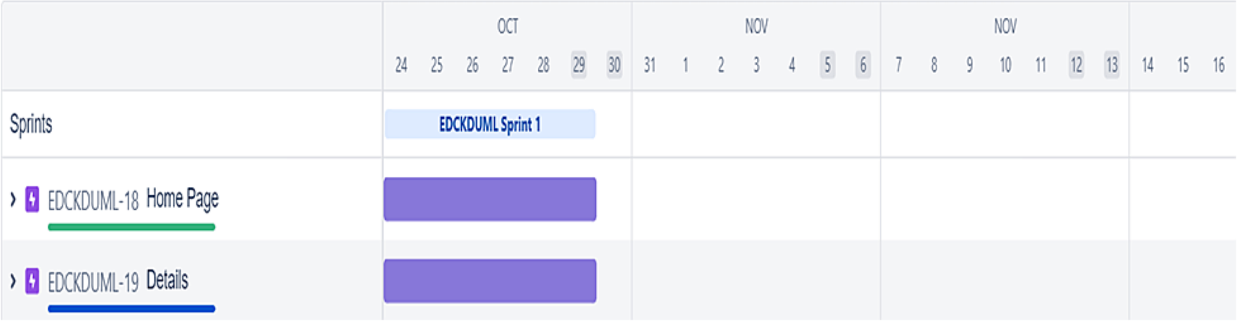
Sprint	Functional Requirement (Epic)	User Story Number	User Story /Task	Story Points	Priority
Sprint-1	Homepage	USN-1	As a user, I can create a website with homepage	5	High
Sprint-1	Details	USN-2	As a user, I can give the details about the disease	15	High
Sprint-2	Awareness	USN-3	As a user, I can create awareness about the disease	5	Low
Sprint-2		USN-4	As a user, I can give the details of the healthy diet	15	Medium
Sprint-3	Diagnosis	USN-5	As a user, I can enter the blood urea details	5	High
Sprint-3		USN-6	As a user, I can enter the glucose random.	10	High
Sprint-3		USN-7	As a user , I can select the test details of the patients	5	Medium
Sprint-4	Data analysis	USN-8	As a user, I can analyse the given data of the patient	5	High
Sprint-4	Result	USN-9	As a user, I can predict the results of the patient	10	High
Sprint-4		USN-10	As a user, I can view the results of the patient	5	High

Sprint Delivery Schedule

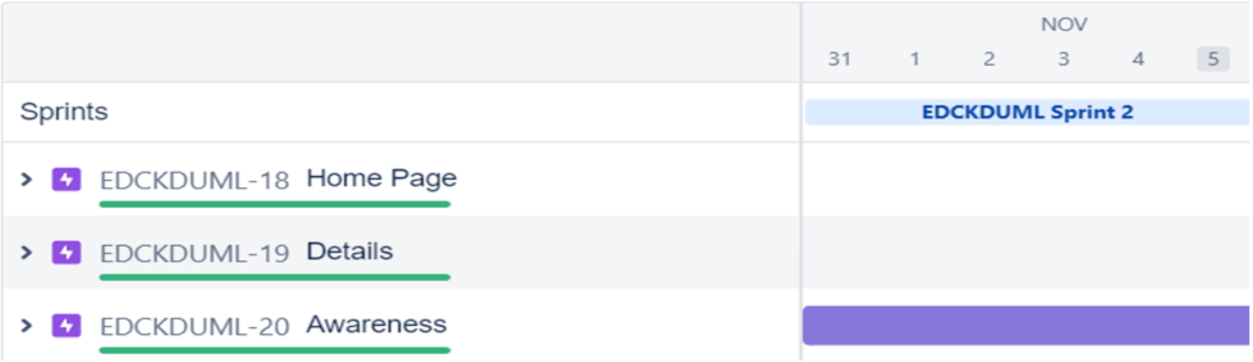
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date(Actual)
Sprint-1	20	6Days	24Oct2022	29Oct2022	20	29Oct2022
Sprint-2	20	6Days	31Oct2022	05Nov2022		
Sprint-3	20	6Days	07Nov2022	12Nov2022		
Sprint-4	20	6Days	14Nov2022	19Nov2022		

Reports from JIRA

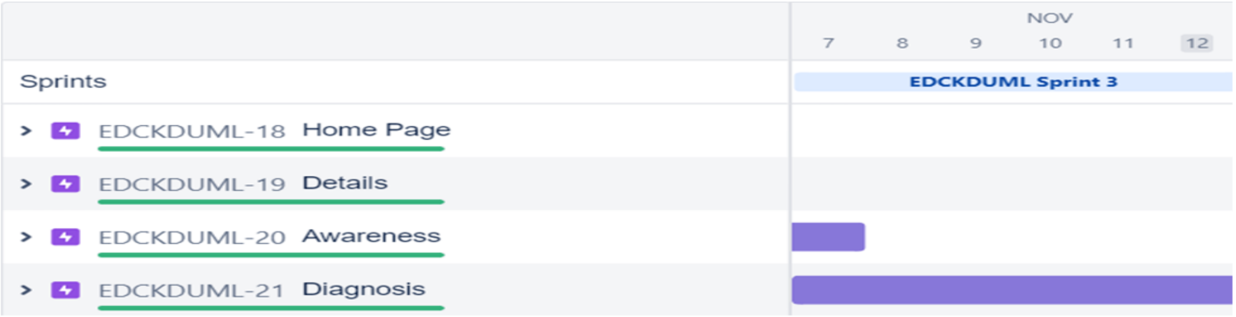
SPRINT 1:



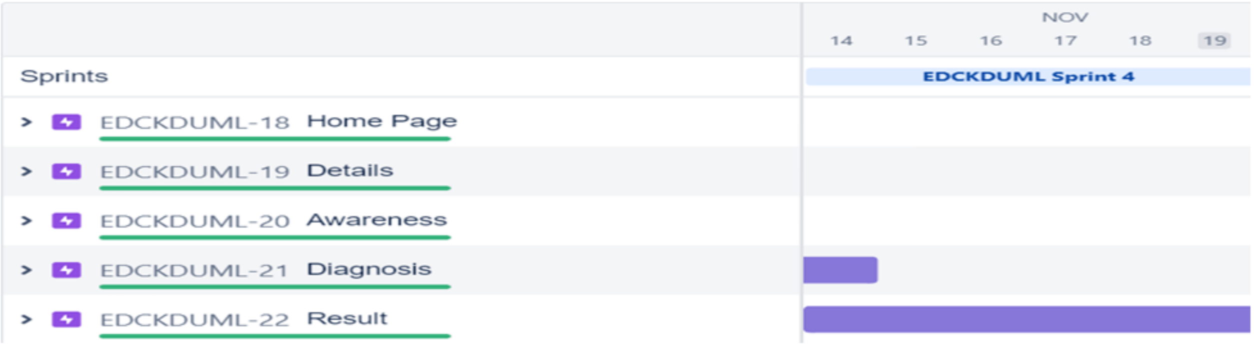
SPRINT 2:



SPRINT 3:



SPRINT 4:



Sprints — EDCKDUML Sprint 4

EDCKDUML-18 Home Page

EDCKDUML-19 Details

EDCKDUML-20 Awareness

EDCKDUML-21 Diagnosis

EDCKDUML-22 Result

7. CODING AND SOLUTIONING

Feature 1:

In our website, we have additionally created some more pages:

Details.html

```
<!DOCTYPE html>

<html>

<head>

<meta charset="UTF-8">

<title>About KIdney Disease</title>

<link rel="stylesheet" href="static/details.css">
```

```html
</head>

<body bgcolor="#000">

<nav>

<label class="logo">Details about Kidney Disease</label>

<nav>

<ul>What is a Kidney Disease?</ul>

</nav>

<div class="details">

<h1>DEFINITION:</h1>

<p>Chronic kidney disease, also called chronic kidney failure, involves a gradual loss<br> of kidney function. Your kidneys filter wastes and excess fluids from your blood, which<br> are then removed in your urine. Advanced chronic kidney disease can cause dangerous<br> levels of fluid, electrolytes and wastes to build up in your body.<br>

    In the early stages of chronic kidney disease, you might have few signs or symptoms.<br> You might not realize that you have kidney disease until the condition is advanced.<br>

    Treatment for chronic kidney disease focuses on slowing the progression of kidney damage,<br> usually by controlling the cause. But, even controlling the cause might not keep<br> kidney damage from progressing. Chronic kidney
```

```
disease can progress to end-stage kidney failure,<br> which is fatal without
artificial filtering (dialysis) or a kidney transplant.</p>

</div>

<div class="images">

<imgsrc="static/4.jpg" class="image">

</div>

<div class="content">

<h1>SYMPTOMS:</h1>

<p>Signs and symptoms of chronic kidney disease develop over time if<br>
kidney damage progresses slowly. Loss of kidney function can cause a<br>
buildup of fluid or body waste or electrolyte problems. Depending on how severe it
is,<br> loss of kidney function can cause:</p>

</div>

<div class="d">

<imgsrc="static/5.jpg">

</div>

<div class="pages">

<h1>The Symptoms are:</h1>
```

```
<p>Nausea<br>
        Vomiting<br>
        Loss of appetite<br>
        Fatigue and weakness<br>
        Sleep problems<br>
        Urinating more or less<br>
        Decreased mental sharpness<br>
        Muscle cramps<br>
        Swelling of feet and ankles<br>
        Dry, itchy skin<br>
        High blood pressure (hypertension) that's difficult to control<br>
        Shortness of breath, if fluid builds up in the lungs<br>
        Chest pain, if fluid builds up around the lining of the heart
</p
</div>
<div class="causes">
<imgsrc="static/6.jpg" class="causes">
```

```
</div>

<div class="c">

<h1>CAUSES:</h1>

<h2>Chronic kidney disease occurs when a disease or condition impairs kidney function, causing kidney damage to worsen over several months or years.<br>

Diseases and conditions that cause chronic kidney disease include:<br></h2>

<p>

        Type 1 or type 2 diabetes<br>

        High blood pressure<br>

        Glomerulonephritis (gloe-mer-u-low-nuh-FRY-tis), an inflammation of the kidney's filtering units (glomeruli)<br>

        Interstitial nephritis (in-tur-STISH-ulnuh-FRY-tis), an inflammation of the kidney's tubules and surrounding structures<br>

        Polycystic kidney disease or other inherited kidney diseases<br>

        Prolonged obstruction of the urinary tract, from conditions such as enlarged prostate, kidney stones and some cancers<br>

        Vesicoureteral (ves-ih-koe-yoo-REE-tur-ul) reflux, a condition that causes urine to back up into your kidneys<br>

        Recurrent kidney infection, also called pyelonephritis (pie-uh-low-nuh-FRY-
tis)<br>
</p>
</div>
</body>
</html>
```

Detail.css

```
*{
    margin: 0;
    padding: 0;
    font: 1em sans-serif;
    text-decoration: none;
    list-style: none;
    box-sizing: border-box;
}
.body{
    font-family: 'Courier New', Courier, monospace;
}
nav{
    background: grey;
    height: 30px;

    width: 100%;

}

label.logo{

    color: white;

    font-size: 35px;

    line-height: 20px;

    padding: 0 100px;

    font-weight: bolder;

    align-items: center;

    position: relative;

    left: 500px;

    top: 33px;

}

nav ul{

    font-size: 50px;

    font-weight: bold;

    font-style: italic;

    line-height: 300%;

    margin-top: 30px;
    color: white;

    -webkit-text-stroke: 1px #fff;

    background: url(static/7.jpg);

    -webkit-background-clip: text;

    background-position: 0 0;

    animation: back 20s linear infinite;

}

@keyframes back{

    100%{

        background-position: 2000px 0;

    }

}

.detail{

    margin-left: 20px;

    margin-top: 500px;

}

.details h1{

    font-size: 30px;

    color: white;

    margin-left: 20px;
    margin-top: 80px;

    font-weight: bolder;

    font-style: oblique;

}

.details p{

    font-size: 20px;

    font-weight: bold;

    line-height: 40px;

    color: white;

    margin-top: 30px;

    justify-content: space-between;

    margin-left: 30px;

}

.image{

    width: 35%;

    height: 80%;

    position: absolute;

    bottom: 0;

    right: 100px;

}
```

```
.content h1{
    font-size: 30px;
    font-weight: bolder;
    font-style: oblique;
    line-height: 80px;
    margin-left: 20px;
    color: white;
    -webkit-text-stroke: 1px #fff;
    background: url(static/8.png);
    -webkit-background-clip: text;
    background-position: 0 0;
    animation: back 20s linear infinite;
}
@keyframes back{
    100%{
        background-position: 2000px 0;
    }
}
.content p{
    font-size: 20px;
    font-weight: bold;
    line-height: 40px;
    margin-top: 0.50px;
    color: white;
    margin-left: 30px;
}
.pages{
    color: white;
}
.pages h1{
    font-size: 30px;
    font-weight: bold;
    line-height: 40px;
    margin-left: 20px;
    color: white;
    -webkit-text-stroke: 1px #fff;
    background: url(static/8.png);
    -webkit-background-clip: text;
    background-position: 0 0;
    animation: back 20s linear infinite;
```

```
}
@keyframes back{
    100%{
        background-position: 2000px 0;
    }
}
.pages p{
    margin-left: 30px;
    font-size: 20px;
    font-weight: bold;
    line-height: 40px;
    margin-left: 30px;
}
.causes{
    width: 50%;
    height: 500px;
    position: absolute;
    bottom: 0;
    right: 100px;
    left: 500px;
    top: 500px;
}
.c{
    font-size: 30px;
    color: white;
}
.c h1{
    font-size: 30px;
    font-weight: bolder;
    line-height: 80px;
    margin-left: 20px;
    color: white;
    -webkit-text-stroke: 1px #fff;
    background: url(static/8.png);
    -webkit-background-clip: text;
    background-position: 0 0;
    animation: back 20s linear infinite;
}
@keyframes back{
    100%{
        background-position: 2000px 0;
    }
}
.c h2{
    font-size: 20px;
    font-weight: bolder;
    line-height: 50px;
    color: white;
    margin-left: 20px;
}
.c p{
    font-size: 20px;
    font-weight: bold;
    line-height: 40px;
    margin-left: 30px;
}
.d{
    width: 50%;
    height: 100px;
    margin-top: 30px;
    margin-left: 300px;

}
```

Feature 2:

Diagnosis.html

```
<!DOCTYPE html>

<html lang="en">

<head>

<title>Diagnosis of test</title>

<link rel="stylesheet" href="static/diagnosis.css">

</head>

<body bgcolor="black">

<div class="tests">

<h1>What tests do doctors use to diagnose and monitor kidney disease?</h1>

<h2>To check for kidney disease, health care providers use:</h2>

<p>A blood test that checks how well your kidneys are filtering your blood,<br>
called GFR. GFR stands for glomerular filtration rate.<br>

            A urine test to check for albumin.<br> Albumin is a protein that can pass
into the urine when the kidneys are damaged.<br>

            If you have kidney disease, your health care provider will use the same
<br>two tests to help monitor your kidney disease and make sure your treatment
plan is working.<br></p>
```

```
</div>

<div class="gfr">

<h1>Blood test for GFR</h1>

<h2>Your health care provider will use a blood test to check your kidney<br>function.<br> The results of the test mean the following:<br></h2>

<p>A GFR of 60 or more is in the normal range.<br> Ask your health care provider when your GFR should be checked again.<br>

A GFR of less than 60 may mean you have kidney disease.<br> Talk with your health care provider about how to keep your kidney health at<br> this level.<br>

A GFR of 15 or less is called kidney failure.<br> Most people below this level need dialysis or a kidney transplant.<br> Talk with your health care provider about your treatment options.</p>

<imgsrc="static/11.jpg" class="gfr">

</div>

<div class="image">

<imgsrc="static/12.png" class="image">

</div>

</body>

</html>
```

Diagnosis.css

```
*{
    margin: 0;
    padding: 0;
    text-decoration: none;
    list-style: none;
    box-sizing: border-box;
}
.body{
    font-family: 'Courier New', Courier, monospace;
}
.tests h1{
    font-size: 50px;
    font-weight: bolder;
    margin-left: 0px;
    color: white;
    -webkit-text-stroke: 1px #fff;
    background: url(static/13.png);
    -webkit-background-clip:text;
    background-position: 0 0;
```

```
 animation: back 20s linear infinite;

}

@keyframes back{

    100%{

        background-position: 2000px 0;

    }

}

.tests{

    color: #fff;

}

.tests h2{

    font-size: 40px;

    font-weight: bold;

    margin-left: 40px;

    margin-top: 40px;

    color: #fff;

}

.tests p{

    margin-top: 50px;
    margin-bottom: 100px;
   margin-left: 40px;
    line-height: 70px;
    font-size: 40px;
    color: #fff;
}
.gfrimg{
    width: 20%;
    height: 50%;
    position: absolute;
    bottom: 0;
    right: 0px;
    top: 100px;
}
.gfr h1{
    font-size: 50px;
    top: 0px;
    color: white;
    -webkit-text-stroke: 1px #fff;
    background: url(static/13.png);
    -webkit-background-clip: text;
    background-position: 0 0;
    animation: back 20s linear infinite;
}
@keyframes back{
    100%{
        background-position: 2000px 0;
    }
}
.gfr h2{
    font-size: 40px;
    font-weight: bold;
    line-height: 70px;
    top: 50px;
    color: #fff;
}
.gfr p{
    font-size: 40px;
    margin-left: 40px;
    margin-top: 40px;
    line-height: 70px;

    color: #fff;

}

.image img{

    width: 25%;

    height: 50%;

    position: absolute;

    bottom: 0;

    right: 0px;

    top: 800px;

}
```

8. TESTING

Test Cases:

Test Case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps to execute	Test Data	Expected Result	Actual Result	Status
Home_TC_001	UI	Home Page	When user clicks on my website, the user can see the home page I've created and it is verified successfully.	HTML , CSS and Flask for integration	1.Create HTML files 2. Run using python	https://127.0.0.1:5000/	Result was not as expected	Actual result was good	Pass
Prediction_TC_002	UI	Prediction Page	Verify the input values valid or not	Flask Server, Python, anaconda prompt	1.Create HTML files 2. Run using Flask	https://127.0.0.1:5000/prediction.html	Working as expected	Satisfied as expected	Pass
Result_TC_003	UI	Result Page	Verify whether the user is able to predict	HTML,CSS, Visual Code	1.Create HTML files 2. Run using Flask	https://127.0.0.1:5000/predict			Pass

User Acceptance Testing

Defect Analysis

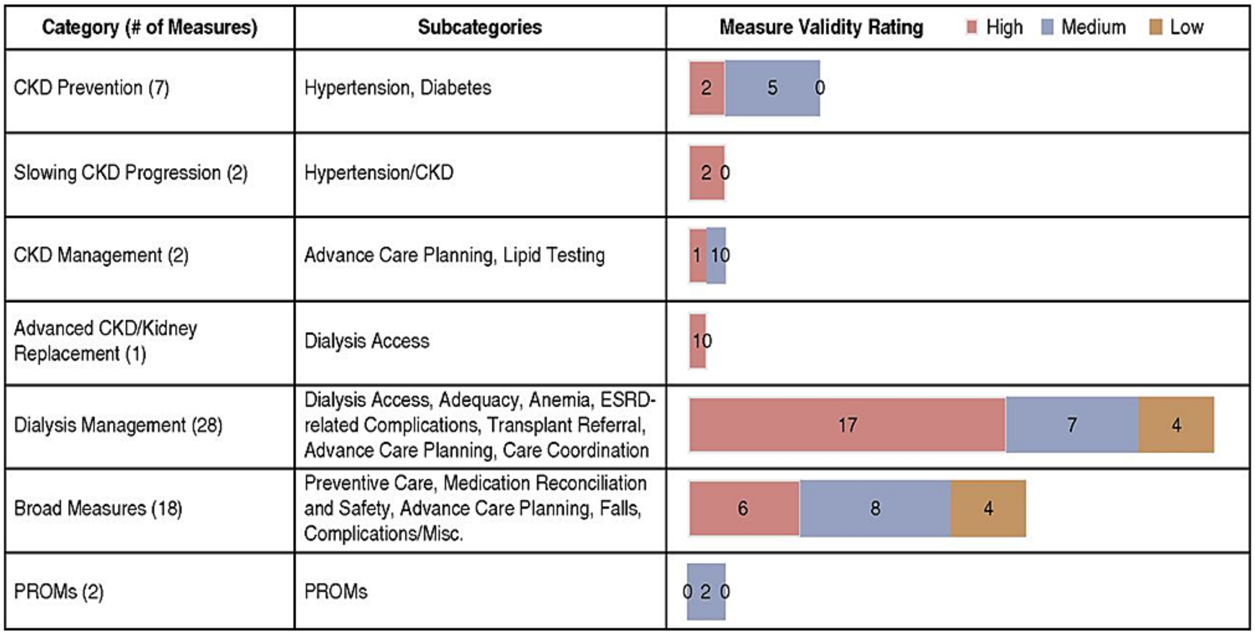
Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

Test Case Analysis

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS:

Performance metrics



Category (# of Measures)	Subcategories	Measure Validity Rating 🟥 High 🟦 Medium 🟫 Low
CKD Prevention (7)	Hypertension, Diabetes	2 5 0
Slowing CKD Progression (2)	Hypertension/CKD	2 0
CKD Management (2)	Advance Care Planning, Lipid Testing	1 1 0
Advanced CKD/Kidney Replacement (1)	Dialysis Access	1 0
Dialysis Management (28)	Dialysis Access, Adequacy, Anemia, ESRD-related Complications, Transplant Referral, Advance Care Planning, Care Coordination	17 7 4
Broad Measures (18)	Preventive Care, Medication Reconciliation and Safety, Advance Care Planning, Falls, Complications/Misc.	6 8 4
PROMs (2)	PROMs	0 2 0

10. ADVANTAGES AND DISADVANTANGES

Advantages:

- Resulted in good accuracy.
- Customers can easily predict CKD.
- This machine learning model helps us in analysing the CKD.

Disadvantages:

- At some point algorithm may fail.
- Correct prediction may not be done.

11. CONCLUSION

This work examines the ability to detect CKD using machine learning algorithms while considering the least number of tests or features. We approach this aim by applying machine learning classifier logistic regression on a big dataset of around 4000 records. We found that haemoglobin, albumin, and specific gravity have the most impact to predict the CKD.

We conclude that by using Machine Learning algorithm , we can predict whether a person is suffering from CKD or not. This effective supervised learning algorithm helps us to analyze the datasets and helps us conclude about the disease. Thus, this project helps customers to easily predict the CKD by giving their data

12. FUTURE SCOPE

This work will be considered as basement for the healthcare system for CKD patients. Also extension to this work is that implementation of deep learning since deep learning provides high-quality performance than machine learning algorithm. In order to help in reducing the prevalence of CKD, we plan to predict if a person with CKD risk factors such as diabetes, hypertension, and family history of kidney failure will have CKD in the future or not by using appropriate dataset.

1. APPENDIX

Source code:

HTML CODING:

Index.html:

```
<!DOCTYPE html>
<html lang="en"
<head>
<title>Kidney Disease Prediction</title>
<link rel="stylesheet" type="text/css" href="static/style.css">
</head>
<body bgcolor="black">
<video src="static/video.mp4" type="video/mp4" autoplay muted
loop></video>
```

```html
<section>

<header class="header">

<div class="nav-bar">

<label class="logo">KIDNEY DISEASE</label>

<div class="menu">

<ul>

<li><a href="index.html">HOME</a></li>

<li><a href="details.html">DETAILS</a></li>

<li><a href="awareness.html">AWARENESS</a></li>

<li><a href="diagnosis.html">DIAGNOSIS</a></li>

<li><a href="prediction.html">PREDICTION</a></li>

</ul>

</div>

</div>

</header>

</section>

<div class="content">

<h1>Chronic Kidney Disease Prediction</h1>

<p>Here you can know more details about Kidney Disease and Treatments</p>
```

```
</div>
</body>
</html>
```

Details.html:

```
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<title>About KIdney Disease</title>
<link rel="stylesheet" href="static/details.css">
</head>
<body bgcolor="#000">
<nav>
<label class="logo">Details about Kidney Disease</label>
<nav>
<ul>What is a Kidney Disease?</ul>
</nav>
<div class="details">
<h1>DEFINITION:</h1>
```

```
<p>Chronic kidney disease, also called chronic kidney failure, involves a
gradual loss<br> of kidney function. Your kidneys filter wastes and excess
fluids from your blood, which<br> are then removed in your urine. Advanced
chronic kidney disease can cause dangerous<br> levels of fluid, electrolytes and
wastes to build up in your body.<br>
        In the early stages of chronic kidney disease, you might have few signs or
symptoms.<br> You might not realize that you have kidney disease until the
condition is advanced.<br>
        Treatment for chronic kidney disease focuses on slowing the progression
of kidney damage,<br> usually by controlling the cause. But, even controlling
the cause might not keep<br> kidney damage from progressing. Chronic kidney
disease can progress to end-stage kidney failure,<br> which is fatal without
artificial filtering (dialysis) or a kidney transplant.</p>
</div>
<div class="images">
<imgsrc="static/4.jpg" class="image">
</div>
<div class="content">
<h1>SYMPTOMS:</h1>
```

```
<p>Signs and symptoms of chronic kidney disease develop over time if<br>
kidney damage progresses slowly. Loss of kidney function can cause a<br>
buildup of fluid or body waste or electrolyte problems. Depending on how
severe it is,<br> loss of kidney function can cause:</p>
</div>
<div class="d">
<img src="static/5.jpg">
</div>
<div class="pages">
<h1>The Symptoms are:</h1>
<p>Nausea<br>
        Vomiting<br>
        Loss of appetite<br>
        Fatigue and weakness<br>
        Sleep problems<br>
        Urinating more or less<br>
        Decreased mental sharpness<br>
        Muscle cramps<br>
        Swelling of feet and ankles<br>
```

```
    Dry, itchy skin<br>
    High blood pressure (hypertension) that's difficult to control<br>
    Shortness of breath, if fluid builds up in the lungs<br>
    Chest pain, if fluid builds up around the lining of the heart
</p>
</div>
<div class="causes">
<imgsrc="static/6.jpg" class="causes">
</div>
<div class="c">
<h1>CAUSES:</h1>
<h2>Chronic kidney disease occurs when a disease or condition impairs kidney function, causing kidney damage to worsen over several months or years.<br>
Diseases and conditions that cause chronic kidney disease include:<br></h2>
<p>
    Type 1 or type 2 diabetes<br>
    High blood pressure<br>
    Glomerulonephritis (gloe-mer-u-low-nuh-FRY-tis), an inflammation of the kidney's filtering units (glomeruli)<br>
```

```
        Interstitial nephritis (in-tur-STISH-ulnuh-FRY-tis), an inflammation of the kidney's tubules and surrounding structures<br>
        Polycystic kidney disease or other inherited kidney diseases<br>
        Prolonged obstruction of the urinary tract, from conditions such as enlarged prostate, kidney stones and some cancers<br>
        Vesicoureteral (ves-ih-koe-yoo-REE-tur-ul) reflux, a condition that causes urine to back up into your kidneys<br>
        Recurrent kidney infection, also called pyelonephritis (pie-uh-low-nuh-FRY-tis)<br>
</p>
</div>
</body>
</html>
```

Awareness.html:

```
<!DOCTYPE html>
<html lang="en">
<head>
<title>Awareness about Kidney Disease</title>
```

```
<link rel="stylesheet" href="static/awareness.css">
</head>
<body bgcolor="#000">
<div class="header">
<imgsrc="static/10.jpg">
</div>
<div class="content">
<h1>AWARENESS</h1>
<h3>This page gives you more awareness about the kidney disease</h3>
<p><br>Public awareness and media coverage of kidney disease is relatively
low <br>compared to other conditions, such as heart disease or
cancer.<br><br> Many people we spoke to knew that the kidneys are a vital
organ,<br> that they act as a filter to remove waste products from the
blood<br> stream and that they are somehow connected to ‘the
waterworks’.<br><br> However, the term ‘kidney disease’ may make people
think of kidney<br> failure, transplants and dialysis.<br><br> As Jim put it, “I
knew you could get kidney failure and things like that,<br> but I didn’t realise
you could just get something small wrong with <br>them”.<br><br> Some
people thought there should be more advertising of<br> kidney disease,
```

especially what causes it, why kidneys are important<br> for the body to stay healthy and what people can do to keep their kidneys healthy.<br><br>

The urgency of making patients aware of CKD could be questioned on the grounds<br> that many patients die before they progress to a more severe stage<br> of CKD and many are already being treated for diabetes and/or hypertension.28,29<br><br> However, there are still compelling reasons why patients would benefit from awareness of<br> their CKD.<br><br> First, they could be made aware of medication exposures that could influence progression, including over-the-counter<br> nonsteroidal anti-inflammatory agents and contrast agents used in imaging tests.<br><br> In addition, there is evidence that appropriate early treatment (with medications and <br>hypertension control) could slow progression of CKD.29 <br><br>Also, patients should be aware that current and future medications could require dose adjustment<br> in the setting of CKD.<br><br> Many conditions, such as heart disease and cognitive decline, may increase<br> with severity of CKD, and awareness of disease may motivate patients to adopt preventive<br> strategies for these conditions.<br><br> Awareness might also make patients more vigilant with adherence to dietary recommendations for comorbid <br>hypertension and diabetes, including lower salt, sugar, and fat intake, as well as <br>other

```
lifestyle changes.</p>
</div>
<div class="health">
<imgsrc="static/9.jpg">
</div>
<div class="foods">
<h1>HEALTHY FOODS</h1>
<h2> Tips for making healthy food choices:</h2>
<p>Cook with a mix of spices instead of salt.<br>
        Choose veggie toppings such as spinach, broccoli, and peppers for your
pizza.<br>
        Try baking or broiling meat, chicken, and fish instead of frying.<br>
        Serve foods without gravy or added fats.<br>
        Try to choose foods with little or no added sugar.<br>
        Gradually work your way down from whole milk to 2 percent milk until
you’re drinking and cooking with fat-free (skim) or low-fat milk and milk
products.<br>
        Eat foods made from whole grains—such as whole wheat, brown rice,
oats, and whole-grain corn—every day. <br>Use whole-grain bread for toast
```

```
and sandwiches; substitute brown rice for white rice for home-cooked meals
and when dining out.<br>
        Read food labels. Choose foods low in saturated fats, trans fats,
cholesterol, salt (sodium), and added sugars.<br>
        Slow down at snack time. Eating a bag of low-fat popcorn takes longer
than eating a slice of cake.<br> Peel and eat an orange instead of drinking
orange juice.<br>
        Try keeping a written record of what you eat for a week.<br> It can help
you see when you tend to overeat or eat foods high in fat or calories.</p>
</div>
</body>
</html>
```

Diagnosis.html:

```
<!DOCTYPE html>
<html lang="en">
<head>
<title>Diagnosis of test</title>
<link rel="stylesheet" href="static/diagnosis.css">
```

```
</head>
<body bgcolor="black">
<div class="tests">
<h1>What tests do doctors use to diagnose and monitor kidney disease?</h1>
<h2>To check for kidney disease, health care providers use:</h2>
<p>A blood test that checks how well your kidneys are filtering your
blood,<br> called GFR. GFR stands for glomerular filtration rate.<br>
        A urine test to check for albumin.<br> Albumin is a protein that can
pass into the urine when the kidneys are damaged.<br>
        If you have kidney disease, your health care provider will use the same
<br>two tests to help monitor your kidney disease and make sure your
treatment plan is working.<br></p>
</div>
<div class="gfr">
<h1>Blood test for GFR</h1>
<h2>Your health care provider will use a blood test to check your
kidney<br>function.<br> The results of the test mean the following:<br></h2>
<p>A GFR of 60 or more is in the normal range.<br> Ask your health care
provider when your GFR should be checked again.<br>
```

```
A GFR of less than 60 may mean you have kidney disease.<br> Talk with your health care provider about how to keep your kidney health at<br> this level.<br>
A GFR of 15 or less is called kidney failure.<br> Most people below this level need dialysis or a kidney transplant.<br> Talk with your health care provider about your treatment options.</p>
<imgsrc="static/11.jpg" class="gfr">
</div>
<div class="image">
<imgsrc="static/12.png" class="image">
</div>
</body>
</html>
```

Prediction.html:

```
<!doctype html>
<html lang="en">
<head>
<!-- Required meta tags -->
```

```
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<!-- Bootstrap CSS -->
<link rel="stylesheet" href="static/prediction.css">
<link href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-
beta3/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-
eOJMYsd53ii+scO/bJGFsiCZc+5NDVN2yr8+0RDqr0Ql0h+rP48ckxlpbzKgwr
a6" crossorigin="anonymous">
<link href="https://unpkg.com/tailwindcss@^2/dist/tailwind.min.css"
rel="stylesheet">
<title>prediction</title>
</head>
<body>
<section class="text-white-900 body-font">
<div class="container  py-5 mx-auto">
<div class="flex flex-col text-center w-full mb-20">
<h1 class="sm:text-6xl text-5xl font-medium title-font mb-4 text-white-
1000">Kidney Disese</h1>
<p class="sm:text-3xl mx-auto leading-relaxed text-base">Fill the form for
```

```
prediction</p>
<h2>{{prediction_text}}</h2>
</div>
<div>
</div>
<a class="btnbtn-primary" href="./" role="button">Back</a>
<form action='/predict' method='POST'>
<div class="mb-3">
<label for="exampleFormControlInput1" class="form-label">Enter blood
urea</label>
<input type="text" class="form-control"  name="blood_urea"
placeholder="blood_urea">
</div>
<div class="mb-3">
<label for="exampleFormControlInput1" class="form-label">Enter blood
glucose</label>
<input type="text" class="form-control" name="blood glucose random"
placeholder="blood glucose random">
</div>
```

```
<div class="mb-3">
<label for="exampleFormControlInput1" class="form-label">Enter coronary_artery_disease</label>
<select class="form-select"  name="coronary_artery_disease" aria-label="Default select example">
<option selected>-- select Enter coronary_artery_disease --</option>
<option value="0">0</option>
<option value="1">1</option>
</select>
</div>
<div class="mb-3">
<label for="exampleFormControlInput1" class="form-label">Enter anemia</label>
<select class="form-select"  name="anemia" aria-label="Default select example">
<option selected>-- select Enter anemia --</option>
<option value="0">0</option>
<option value="1">1</option>
</select>
```

```
</div>
<div class="mb-3">
<label for="exampleFormControlInput1" class="form-label">Enter
pus_cell</label>
<select class="form-select"  name="pus_cell" aria-label="Default select
example">
<option selected>-- select Enter pus_cell --</option>
<option value="0">0</option>
<option value="1">1</option>
</select>
</div>
<div class="mb-3">
<label for="exampleFormControlInput1" class="form-label">Enter
red_blood_cells</label>
<select class="form-select"  name="red_blood_cells" aria-label="Default select
example">
<option selected>-- select Enter red_blood_cells --</option>
<option value="0">0</option>
<option value="1">1</option>
```

```
</select>
</div>
<div class="mb-3">
<label for="exampleFormControlInput1" class="form-label">Enter
diabetesmellitus</label>
<select class="form-select"  name="diabetesmellitus" aria-label="Default select
example">
<option selected>-- select Enter diabetesmellitus --</option>
<option value="0">0</option>
<option value="1">1</option>
<option value="2">2</option>
</select>
</div>
<div class="mb-3">
<label for="exampleFormControlInput1" class="form-label">Enter
pedal_edema</label>
<select class="form-select"  name="pedal_edema" aria-label="Default select
example">
<option selected>-- select Enter pedal_edema --</option>
```

```
<option value="0">0</option>

<option value="1">1</option>

</select>

</div>

<button type="submit" class="btnbtn-primary">Predict</button>

</form>

</div>

</section>

</body>

</html>
```

Success.html:

```
<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">

<meta http-equiv="X-UA-Compatible" content="IE=edge">

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<title>Result Page</title>
```

```
<link rel="stylesheet" type="text/css" href="static/success.css">

</head>

<body>

<div class="image">

<h1>You are a healthy person!!!</h1>

<imgsrc="static/15.jpg">

</div>

</body>

</html>
```

Failure.html:

```
<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">

<meta http-equiv="X-UA-Compatible" content="IE=edge">

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<title>Result Page</title>

<link rel="stylesheet" type="text/css" href="static/failure.css">
```

```
</head>

<body>

<div class="image">

<h1>OOPS You have kidney disease!!!</h1>

<imgsrc="static/16.png">

</div>

</body>

</html>
```

CSS CODING:

Style.css:

```
*{

   margin: 0;

   padding: 0;

   box-sizing: border-box;

}

a,a:hover{

   text-decoration: none;

}
```

```
ul{
    list-style: none;
}
.navbar{
    background: #000;
    height: 80px;
    width: 100%;
    font-size: 20px;
}
.header .nav-bar{
    width: 90%;
    height: 80px;
    line-height: 80px;
    margin: auto;
    color: white;
    display: flex;
justify-content: space-between;
    font-size: 30;
}
```

```
.header .nav-bar .logo{

    z-index: 1;

    position: relative;

    left: 25px;

    font-size: 20px;

    color: transparent;

    -webkit-text-stroke: 1px #fff;

    background: url(static/1.jpg);

    -webkit-background-clip: text;

    background-position: 0 0;

    animation: back 20s linear infinite;

}

@keyframes back{

    100%{

        background-position: 2000px 0;

    }

}

.header .nav-bar .logo a{

    font-size: 20px;
    font-weight: bold;

    padding: 10px;

    line-height: 10px;

    text-transform: uppercase;

}

.header .nav-bar .menu{

    z-index: 2;

}

.header .nav-bar .menu ul li{

    display: inline-block;

    line-height: 20px;

    margin-right: 50px;

}

.header .nav-bar .menu ul li a{

    font-size: 20px;

    font-weight: bold;

    padding: 5px;

    text-transform: capitalize;

    transition: all 0.5s;
```

```css
    opacity: 0.8;

    color: black;

    -webkit-text-stroke: #fff;

}

.header .nav-bar .menu ul li a.active{

    background-color: #fff;

    color: #000;

    font-weight: bold;

}

.header .nav-bar .menu ul li a:hover{

    opacity: 1;

    background-color: #fff;

    color: #000;

}

.content{

    width: 100%;

    position: absolute;

    top: 50%;

    transform: translateY(-50%);
    text-align: center;
    color: black;
}
.content h1{
    font-size: 100px;
    margin-top: 80px;
    font-style: italic;
    color: white;
    font-weight: bolder;
    color: white;
    -webkit-text-stroke: 1px #fff;
    background: url(static/3.jpg);
    -webkit-background-clip: text;
}
.content p{
    margin: 20px auto;
    font-weight: 200;
    line-height: 25px;
    font-size: 40px;
```

```css
    color: #fff;
}
video{
    position: fixed;
    right: 0;
    bottom: 0;
    width: 100%;
    height: 100vh;
}
```

Details.css:

```css
*{
    margin: 0;
    padding: 0;
    text-decoration: none;
    list-style: none;
    box-sizing: border-box;
}
.body{
    font-family: 'Courier New', Courier, monospace;
```

```
}
.tests h1{
    font-size: 50px;
    font-weight: bolder;
    margin-left: 0px;
    color: white;
    -webkit-text-stroke: 1px #fff;
    background: url(static/13.png);
    -webkit-background-clip:text;
    background-position: 0 0;
    animation: back 20s linear infinite;
}
@keyframes back{
    100%{
        background-position: 2000px 0;
    }
}
.tests{
    color: #fff;
```

```
}

.tests h2{

    font-size: 40px;

    font-weight: bold;

    margin-left: 40px;

    margin-top: 40px;

    color: #fff;

}

.tests p{

    margin-top: 50px;

    margin-bottom: 100px;

    margin-left: 40px;

    line-height: 70px;

    font-size: 40px;

    color: #fff;

}

.gfrimg{

    width: 20%;

    height: 50%;
    position: absolute;

    bottom: 0;

    right: 0px;

    top: 100px;

}

.gfr h1{

    font-size: 50px;

    top: 0px;

    color: white;

    -webkit-text-stroke: 1px #fff;

    background: url(static/13.png);

    -webkit-background-clip: text;

    background-position: 0 0;

    animation: back 20s linear infinite;

}

@keyframes back{

    100%{

        background-position: 2000px 0;

    }
```

```
}

.gfr h2{

    font-size: 40px;

    font-weight: bold;

    line-height: 70px;

    top: 50px;

    color: #fff;

}

.gfr p{

    font-size: 40px;

    margin-left: 40px;

    margin-top: 40px;

    line-height: 70px;

    color: #fff;

}

.imageimg{

    width: 25%;

    height: 50%;

    position: absolute;
    bottom:   0;
    right:   0px;
    top: 800px;
}
```

Awareness.css:

```
*{
    padding: 0;
    margin: 0;
    box-sizing: border-box;
    font-family: 'Josefin Sans, sans-serif';
}
.header{
    margin-left: 30px;
    margin-top: 30px;
    color: white;
}
.header img{
    width: 40%;
    height: 100%;

    position: absolute;

    bottom: 0;

    right: 0px;

    top: 0px;

}

.content h1{

    font-size: 40px;

    font-weight: bolder;

    color: white;

    -webkit-text-stroke: 1px #fff;

    background: url(static/8.png);

    -webkit-background-clip: text;

    background-position: 0 0;

    animation: back 20s linear infinite;

}

@keyframes back{

    100%{

        background-position: 2000px 0;
    }
}
.content h3{
    font-size: 30px;
    font-weight: bold;
    margin-top: 20px;
    color: white;
    -webkit-text-stroke: 1px #fff;
    background: url(static/8.png);
    -webkit-background-clip: text;
    background-position: 0 0;
    animation: back 20s linear infinite;
}
@keyframes back{
    100%{
        background-position: 2000px 0;
    }
}
.content p{
    margin-top: 2px;

    margin-bottom: 100px;

    margin-left: 40px;

    line-height: 40px;

    font-size: 30px;

    color: #fff;

}

.health{

    margin-right: 0;

    margin-top: 100px;

}

.health img{

    margin-right: 0px;

    float: right;

}

.foods{

    margin-left: 0px;

    margin-top: 30px;

    color: white;
```

```
}
.foods h1{
    margin-left: 0px;
    margin-top: 50px;
    font-size: 40px;
    font-weight: bolder;
    color: white;
    -webkit-text-stroke: 1px #fff;
    background: url(static/8.png);
    -webkit-background-clip: text;
    background-position: 0 0;
    animation: back 20s linear infinite;
}
.foods h2{
    font-size: 30px;
    font-weight: bold;
    margin-top: 20px;
    color: white;
    -webkit-text-stroke: 1px #fff;
    background: url(static/8.png);
    -webkit-background-clip: text;
    background-position: 0 0;
    animation: back 20s linear infinite;
}
@keyframes back{
    100%{
        background-position: 2000px 0;
    }
}
.foods p{
    margin-top: 30px;
    margin-bottom: 100px;
    margin-left: 40px;
    line-height: 60px;
    font-size: 30px;
    color: #fff;
}
```

Diagnosis.css:

```
*{

    margin: 0;

    padding: 0;

    text-decoration: none;

    list-style: none;

    box-sizing: border-box;

}

.body{

    font-family: 'Courier New', Courier, monospace;

}

.tests h1{

    font-size: 50px;

    font-weight: bolder;

    margin-left: 0px;

    color: white;

    -webkit-text-stroke: 1px #fff;

    background: url(static/13.png);

    -webkit-background-clip:text;
    background-position: 0 0;

    animation: back 20s linear infinite;

}

@keyframes back{

    100%{

        background-position: 2000px 0;

    }

}

.tests{

    color: #fff;

}

.tests h2{

    font-size: 40px;

    font-weight: bold;

    margin-left: 40px;

    margin-top: 40px;

    color: #fff;

}

.tests p{
    margin-top: 50px;

    margin-bottom: 100px;

    margin-left: 40px;

    line-height: 70px;

    font-size: 40px;

    color: #fff;

}

.gfrimg{

    width: 20%;

    height: 50%;

    position: absolute;

    bottom: 0;

    right: 0px;

    top: 100px;

}

.gfr h1{

    font-size: 50px;

    top: 0px;

    color: white;
    -webkit-text-stroke: 1px #fff;

    background: url(static/13.png);

    -webkit-background-clip: text;

    background-position: 0 0;

    animation: back 20s linear infinite;

}

@keyframes back{

    100%{

        background-position: 2000px 0;

    }

}

.gfr h2{

    font-size: 40px;

    font-weight: bold;

    line-height: 70px;

    top: 50px;

    color: #fff;

}

.gfr p{
    font-size: 40px;

    margin-left: 40px;

    margin-top: 40px;

    line-height: 70px;

    color: #fff;

}

.imageimg{

    width: 25%;

    height: 50%;

    position: absolute;

    bottom: 0;

    right: 0px;

    top: 800px;

}
```

Flask Integrate With Scoring End Pints:

```
import pickle

import numpy as np

import pandas as pd
```

```
from flask import Flask, render_template, request
app=Flask(__name__, template_folder='templates')
model=pickle.load(open('CKD.pkl','rb'))


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


@app.route('/details.html')
def details():
    return render_template('details.html')


@app.route('/awareness.html')
def awareness():
    return render_template('awareness.html')


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

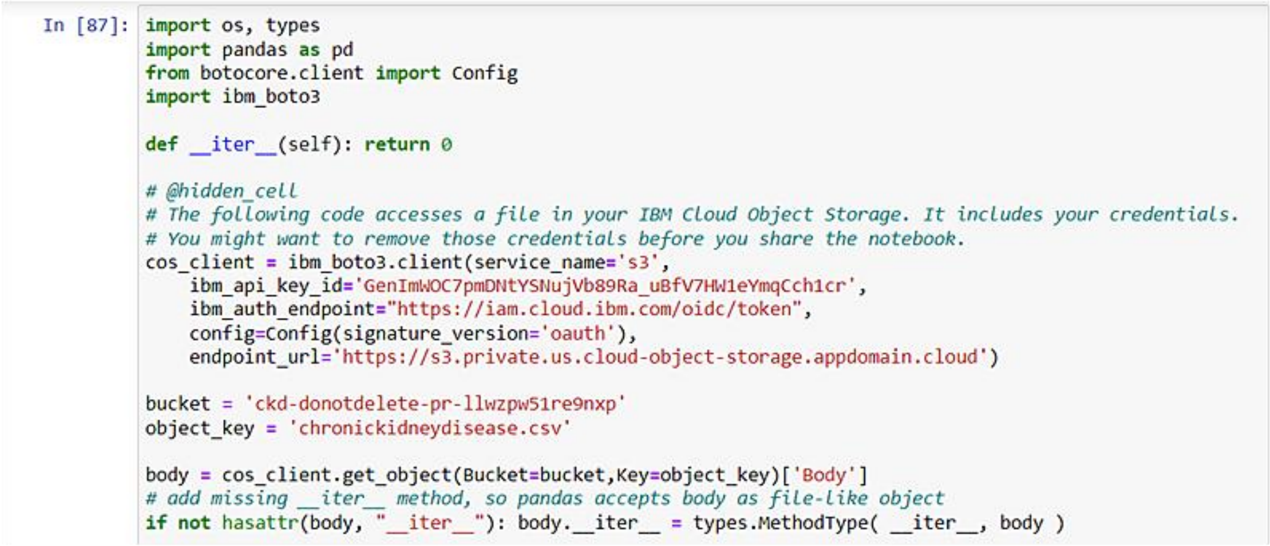
```
@app.route('/prediction.html')

def prediction():

    return render_template('prediction.html')



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

def predict():

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

    features_value=[np.array(input_features)]

features_name=['blood_urea','blood glucose

random','coronary_artery_disease','anemia','pus_cell','red_blood_cells','diabetes

mellitus','pedal_edema']

df=pd.DataFrame(features_value, columns=features_name)

output=model.predict(df)

 if output == 1:

        return render_template('success.html')

    else:

        return render_template('failure.html')
```

if__name___== '__main__':

app.run(debug=True)

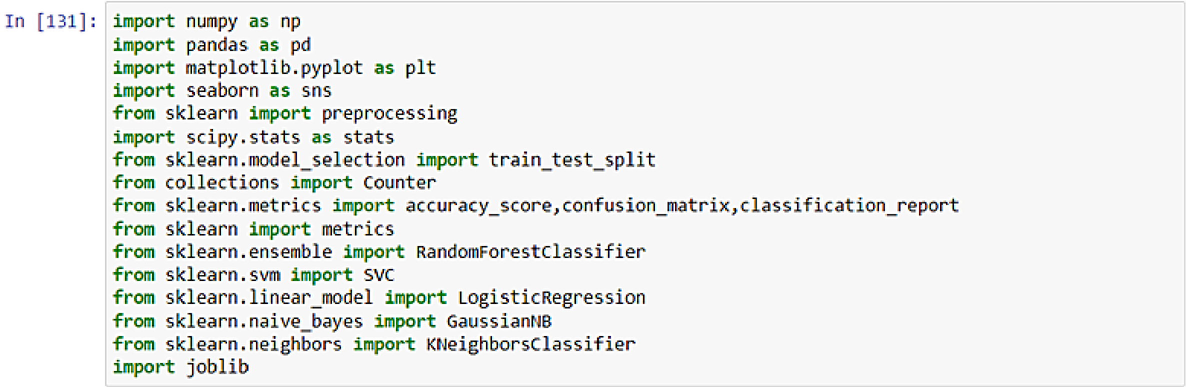
NOTEBOOK .ipynb

Import Dataframe:



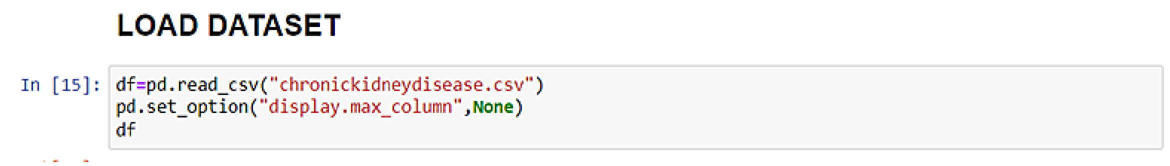
```
In [87]: import os, types
         import pandas as pd
         from botocore.client import Config
         import ibm_boto3

         def __iter__(self): return 0

         # @hidden_cell
         # The following code accesses a file in your IBM Cloud Object Storage. It includes your credentials.
         # You might want to remove those credentials before you share the notebook.
         cos_client = ibm_boto3.client(service_name='s3',
             ibm_api_key_id='GenImWOC7pmDNtYSNujVb89Ra_uBfV7HW1eYmqCch1cr',
             ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
             config=Config(signature_version='oauth'),
             endpoint_url='https://s3.private.us.cloud-object-storage.appdomain.cloud')

         bucket = 'ckd-donotdelete-pr-llwzpw51re9nxp'
         object_key = 'chronickidneydisease.csv'

         body = cos_client.get_object(Bucket=bucket,Key=object_key)['Body']
         # add missing __iter__ method, so pandas accepts body as file-like object
         if not hasattr(body, "__iter__"): body.__iter__ = types.MethodType( __iter__, body )
```

Import Libraries:



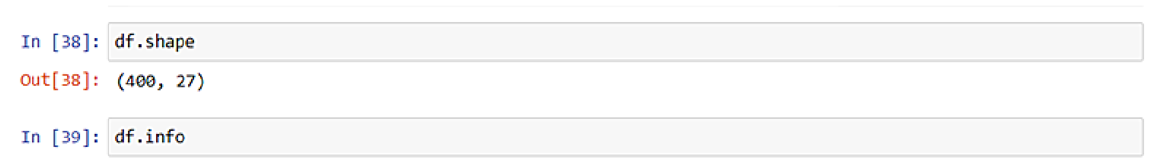
```
In [131]: import numpy as np
          import pandas as pd
          import matplotlib.pyplot as plt
          import seaborn as sns
          from sklearn import preprocessing
          import scipy.stats as stats
          from sklearn.model_selection import train_test_split
          from collections import Counter
          from sklearn.metrics import accuracy_score,confusion_matrix,classification_report
          from sklearn import metrics
          from sklearn.ensemble import RandomForestClassifier
          from sklearn.svm import SVC
          from sklearn.linear_model import LogisticRegression
          from sklearn.naive_bayes import GaussianNB
          from sklearn.neighbors import KNeighborsClassifier
          import joblib
```

Load The Dataset:

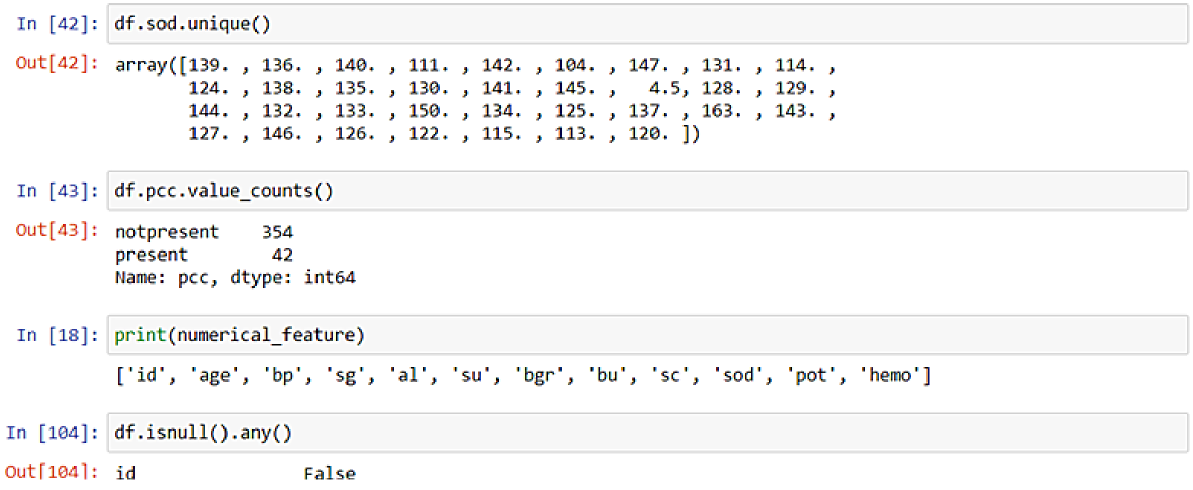


LOAD DATASET

```
In [15]: df=pd.read_csv("chronickidneydisease.csv")
         pd.set_option("display.max_column",None)
         df
```

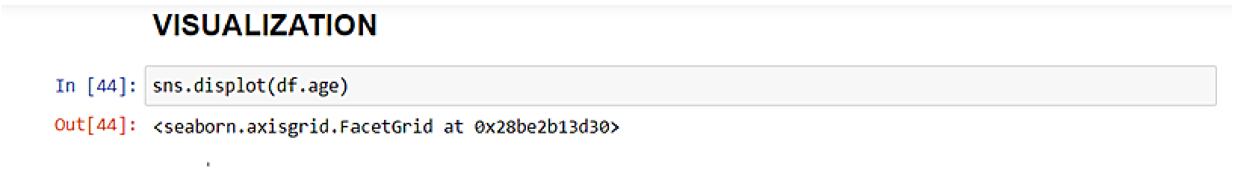


```
In [38]: df.shape

Out[38]: (400, 27)

In [39]: df.info
```



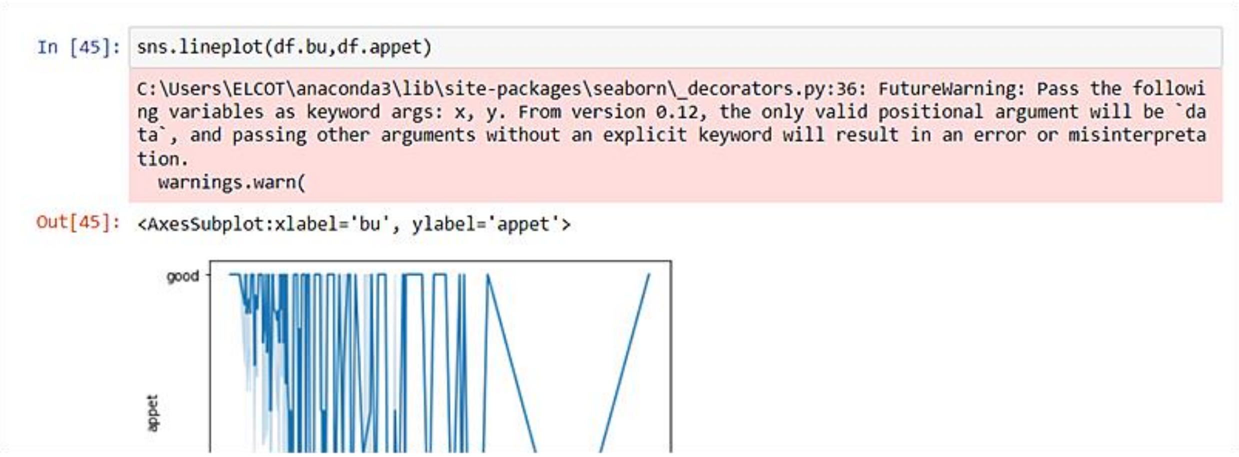
```
In [42]: df.sod.unique()

Out[42]: array([139. , 136. , 140. , 111. , 142. , 104. , 147. , 131. , 114. ,
                124. , 138. , 135. , 130. , 141. , 145. ,   4.5, 128. , 129. ,
                144. , 132. , 133. , 150. , 134. , 125. , 137. , 163. , 143. ,
                127. , 146. , 126. , 122. , 115. , 113. , 120. ])

In [43]: df.pcc.value_counts()

Out[43]: notpresent    354
         present        42
         Name: pcc, dtype: int64

In [18]: print(numerical_feature)

         ['id', 'age', 'bp', 'sg', 'al', 'su', 'bgr', 'bu', 'sc', 'sod', 'pot', 'hemo']

In [104]: df.isnull().any()

Out[104]: id                 False
```

Visualization:

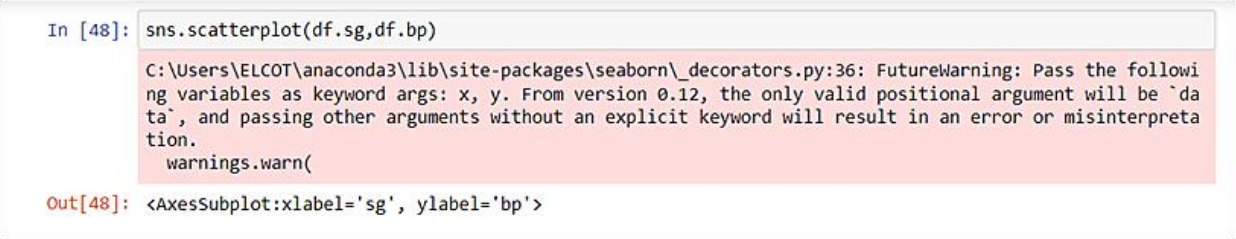


VISUALIZATION

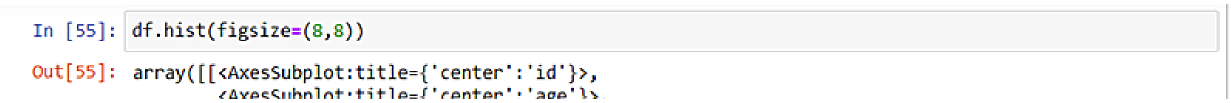
```
In [44]: sns.displot(df.age)

Out[44]: <seaborn.axisgrid.FacetGrid at 0x28be2b13d30>
```



```
In [45]: sns.lineplot(df.bu,df.appet)

C:\Users\ELCOT\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the followi
ng variables as keyword args: x, y. From version 0.12, the only valid positional argument will be `da
ta`, and passing other arguments without an explicit keyword will result in an error or misinterpreta
tion.
  warnings.warn(

Out[45]: <AxesSubplot:xlabel='bu', ylabel='appet'>
```

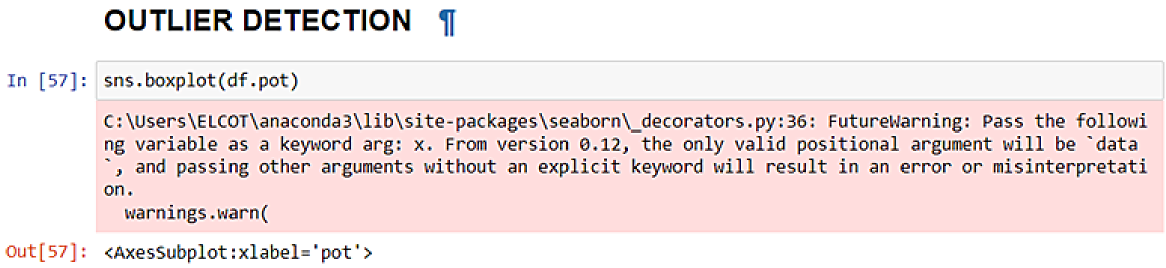


```
In [48]: sns.scatterplot(df.sg,df.bp)

C:\Users\ELCOT\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the followi
ng variables as keyword args: x, y. From version 0.12, the only valid positional argument will be `da
ta`, and passing other arguments without an explicit keyword will result in an error or misinterpreta
tion.
  warnings.warn(

Out[48]: <AxesSubplot:xlabel='sg', ylabel='bp'>
```



```
In [55]: df.hist(figsize=(8,8))

Out[55]: array([[<AxesSubplot:title={'center':'id'}>,
                 <AxesSubplot:title={'center':'age'}>,
```

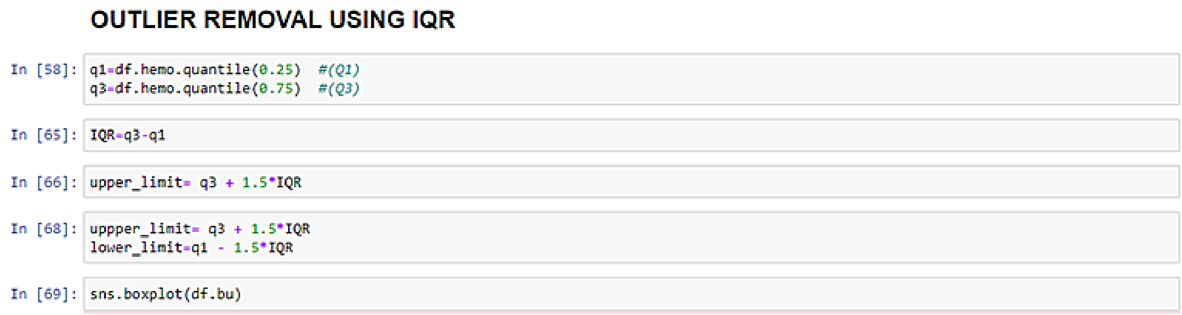
Outlier Detection:



OUTLIER DETECTION ¶

```
In [57]: sns.boxplot(df.pot)

C:\Users\ELCOT\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the followi
ng variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data
`, and passing other arguments without an explicit keyword will result in an error or misinterpretati
on.
  warnings.warn(

Out[57]: <AxesSubplot:xlabel='pot'>
```

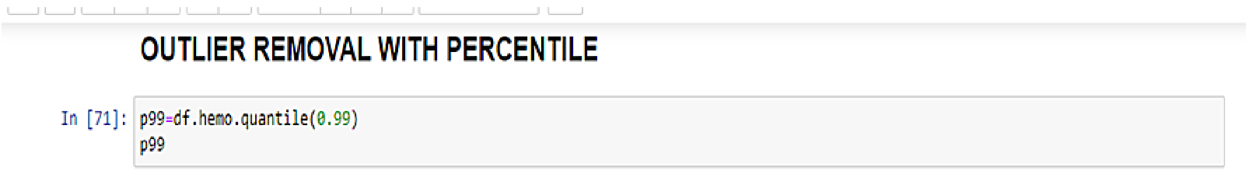
Outlier Using IQR:



OUTLIER REMOVAL USING IQR

```
In [58]: q1=df.hemo.quantile(0.25)  #(Q1)
         q3=df.hemo.quantile(0.75)  #(Q3)

In [65]: IQR=q3-q1

In [66]: upper_limit= q3 + 1.5*IQR

In [68]: uppper_limit= q3 + 1.5*IQR
         lower_limit=q1 - 1.5*IQR

In [69]: sns.boxplot(df.bu)
```

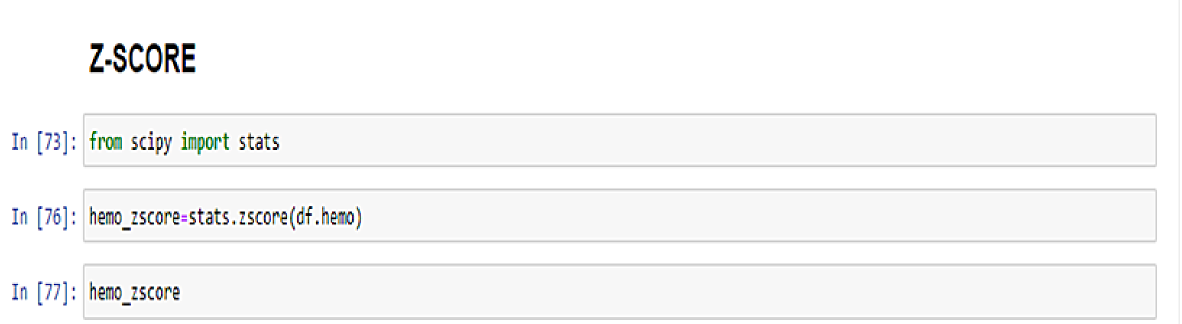
Outlier removal with percentile:



OUTLIER REMOVAL WITH PERCENTILE

```
In [71]: p99=df.hemo.quantile(0.99)
         p99
```

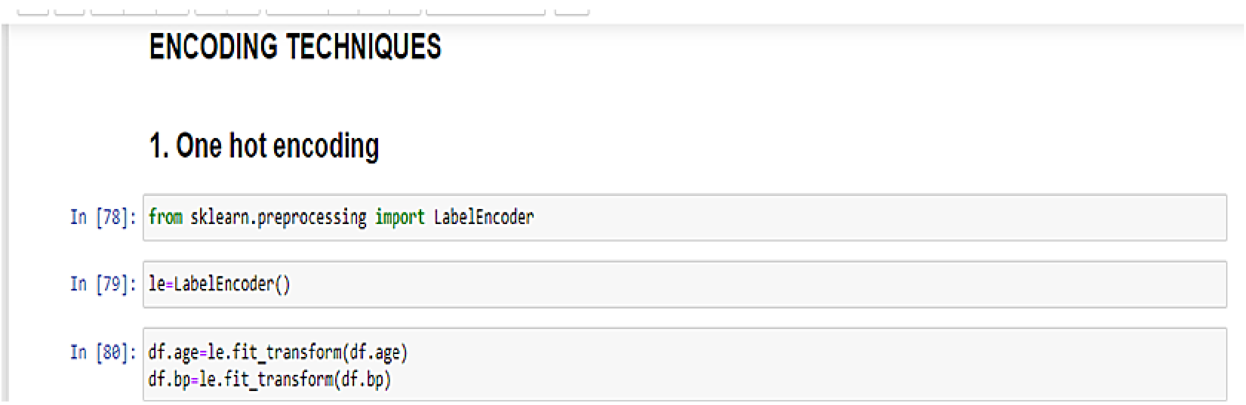
Z-Score:



Z-SCORE

```
In [73]: from scipy import stats

In [76]: hemo_zscore=stats.zscore(df.hemo)

In [77]: hemo_zscore
```

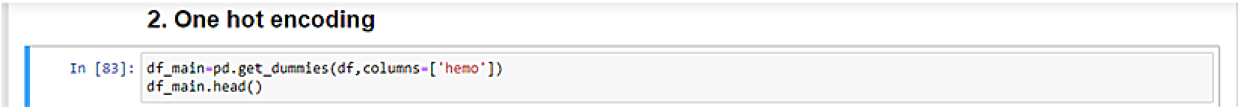
Encoding Techniques:



ENCODING TECHNIQUES

1. One hot encoding

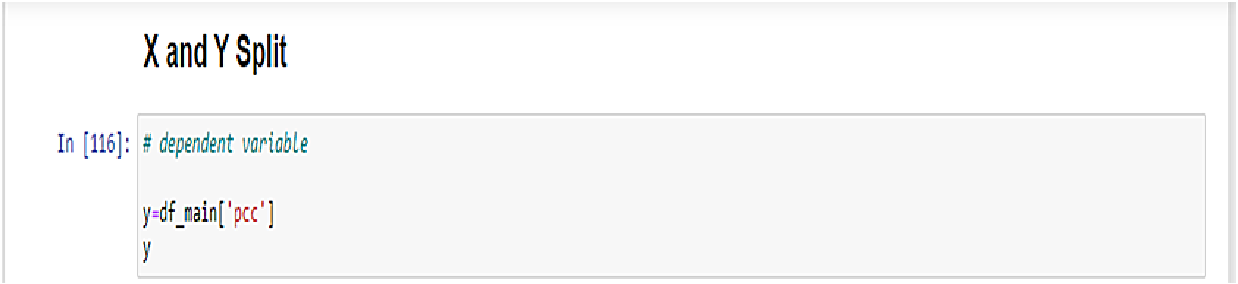
```
In [78]: from sklearn.preprocessing import LabelEncoder

In [79]: le=LabelEncoder()

In [80]: df.age=le.fit_transform(df.age)
         df.bp=le.fit_transform(df.bp)
```



2. One hot encoding

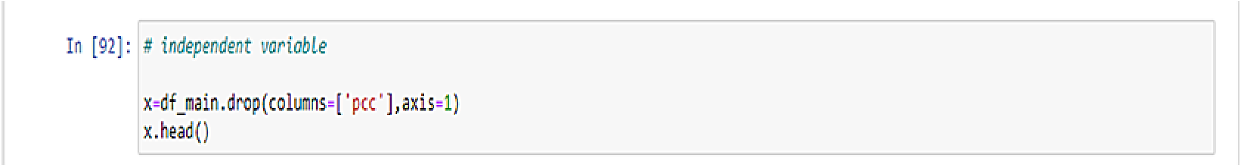
```
In [83]: df_main=pd.get_dummies(df,columns=['hemo'])
         df_main.head()
```

X and Y Split:



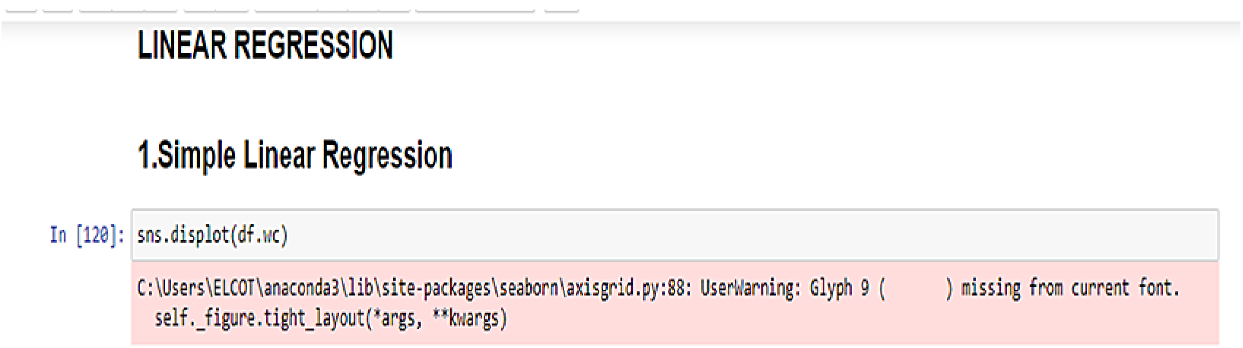
X and Y Split

```
In [116]: # dependent variable

          y=df_main['pcc']
          y
```



```
In [92]: # independent variable

         x=df_main.drop(columns=['pcc'],axis=1)
         x.head()
```

Linear Regression:

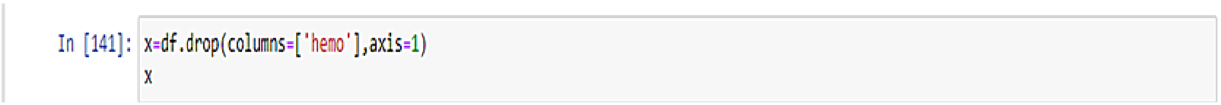


LINEAR REGRESSION

1.Simple Linear Regression

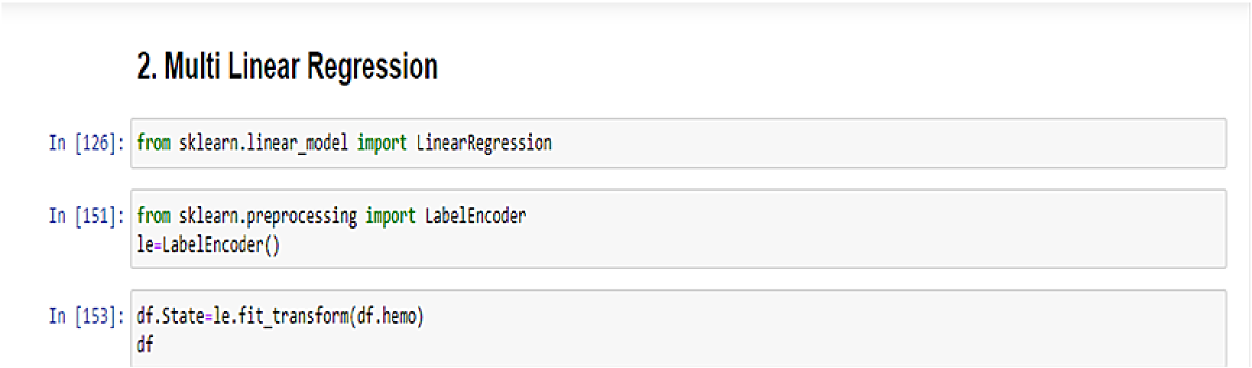
```
In [120]: sns.displot(df.wc)
```

```
C:\Users\ELCOT\anaconda3\lib\site-packages\seaborn\axisgrid.py:88: UserWarning: Glyph 9 (       ) missing from current font.
  self._figure.tight_layout(*args, **kwargs)
```



```
In [141]: x=df.drop(columns=['hemo'],axis=1)
          x
```

Multi Linear Regression:

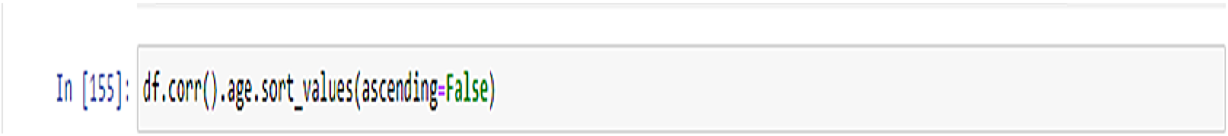


2. Multi Linear Regression

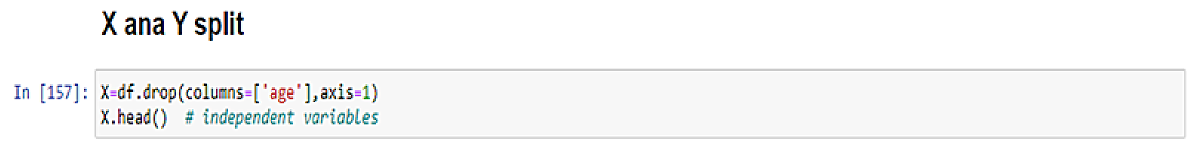
```
In [126]: from sklearn.linear_model import LinearRegression
```

```
In [151]: from sklearn.preprocessing import LabelEncoder
          le=LabelEncoder()
```

```
In [153]: df.State=le.fit_transform(df.hemo)
          df
```

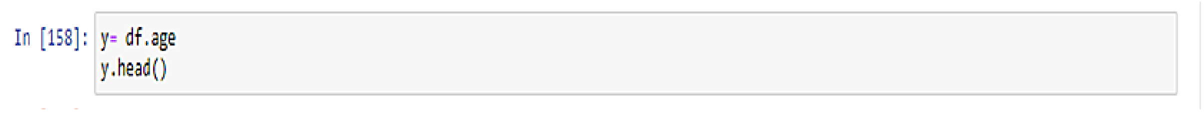


```
In [155]: df.corr().age.sort_values(ascending=False)
```



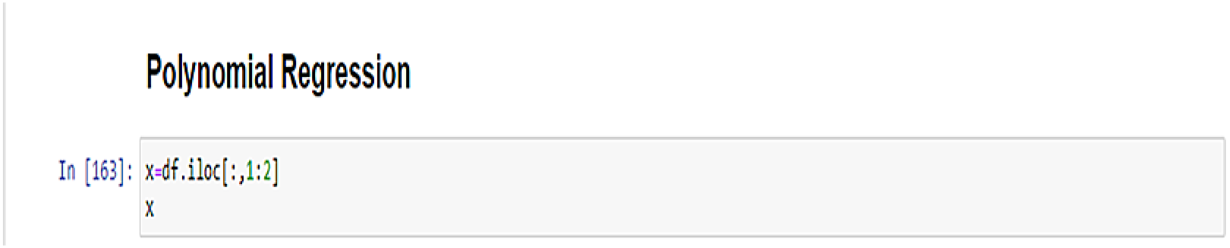
X ana Y split

```
In [157]: X=df.drop(columns=['age'],axis=1)
          X.head()  # independent variables
```



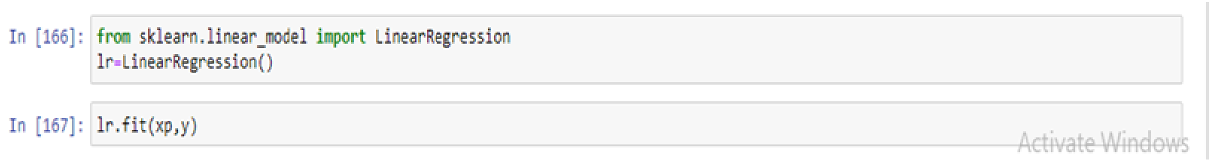
```
In [158]: y= df.age
          y.head()
```

Polynomial Regression:

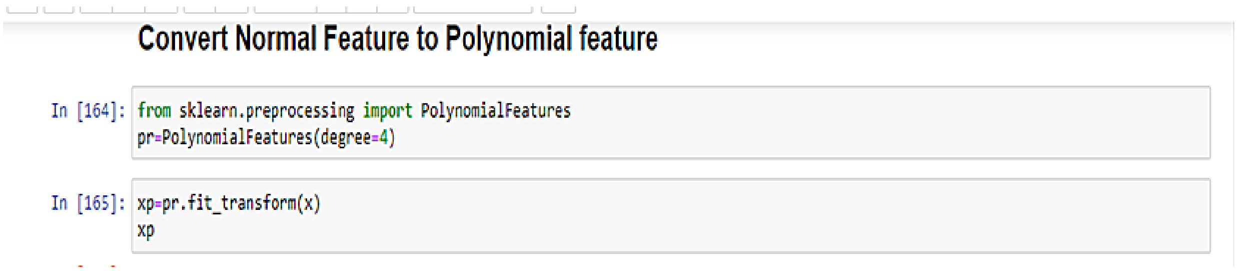


Polynomial Regression

```
In [163]: x=df.iloc[:,1:2]
          x
```

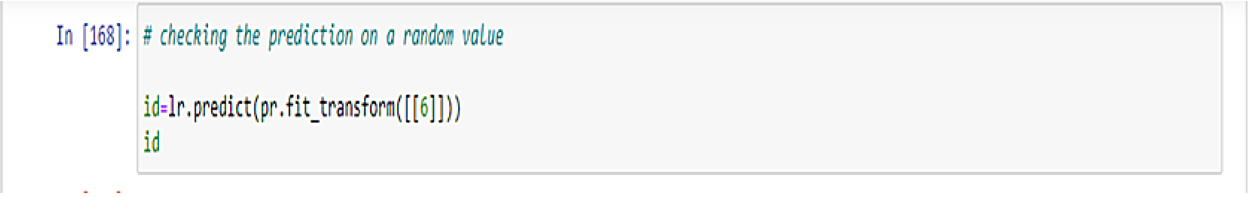


```
In [166]: from sklearn.linear_model import LinearRegression
          lr=LinearRegression()

In [167]: lr.fit(xp,y)
```



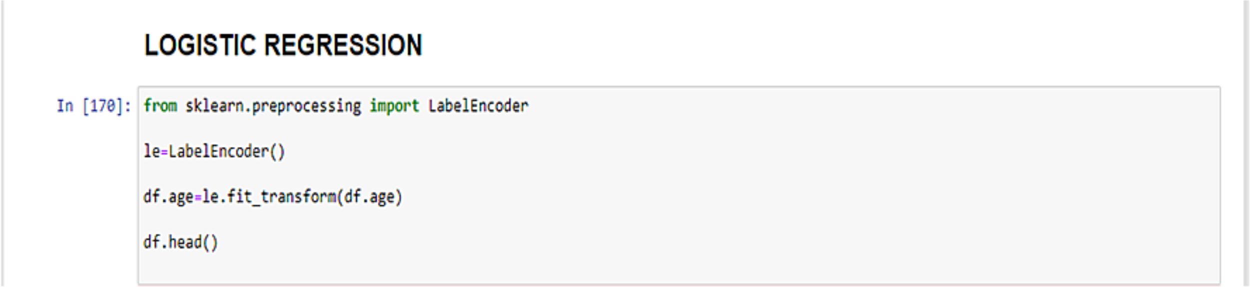
Convert Normal Feature to Polynomial feature

```
In [164]: from sklearn.preprocessing import PolynomialFeatures
          pr=PolynomialFeatures(degree=4)

In [165]: xp=pr.fit_transform(x)
          xp
```



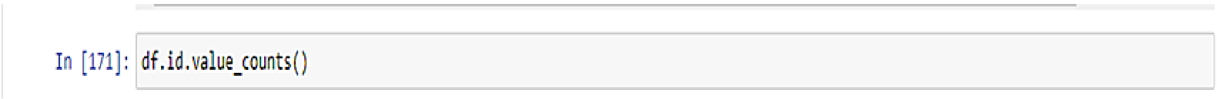
```
In [168]: # checking the prediction on a random value

          id=lr.predict(pr.fit_transform([[6]]))
          id
```

Logistic Regression:

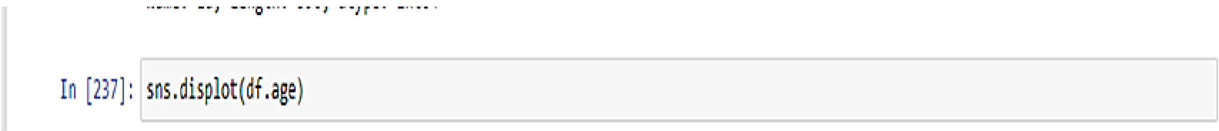


LOGISTIC REGRESSION

```
In [170]: from sklearn.preprocessing import LabelEncoder

          le=LabelEncoder()

          df.age=le.fit_transform(df.age)

          df.head()
```

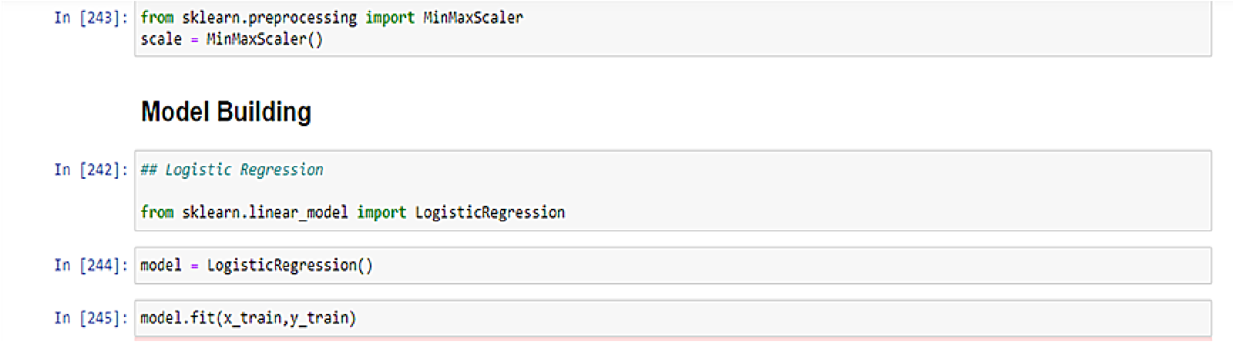


```
In [171]: df.id.value_counts()
```



```
In [237]: sns.displot(df.age)
```

Model Building:

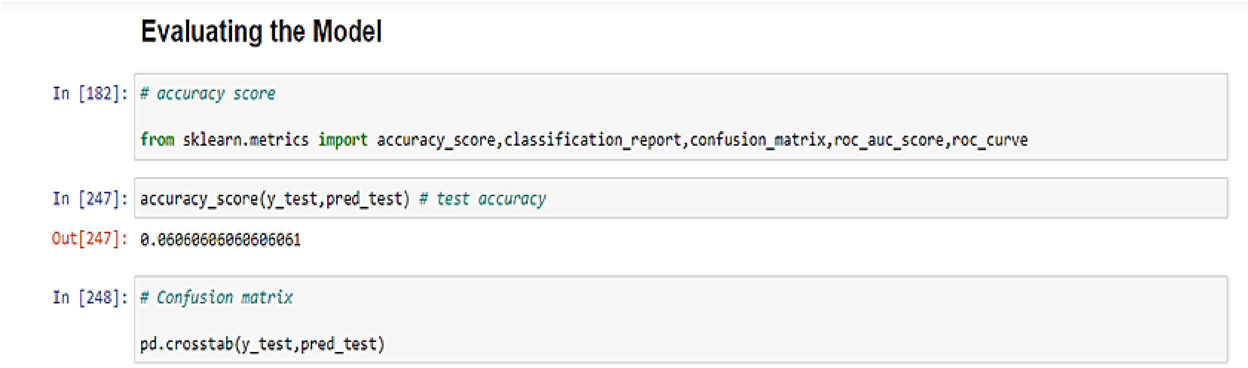


```
In [243]: from sklearn.preprocessing import MinMaxScaler
          scale = MinMaxScaler()
```

Model Building

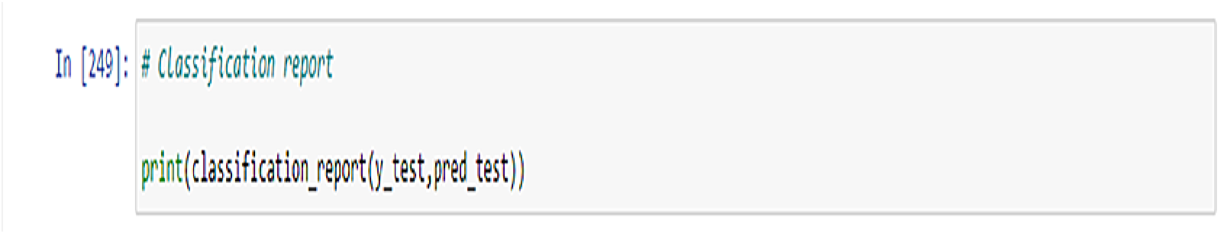
```
In [242]: ## Logistic Regression

          from sklearn.linear_model import LogisticRegression

In [244]: model = LogisticRegression()

In [245]: model.fit(x_train,y_train)
```

Evaluating Model:

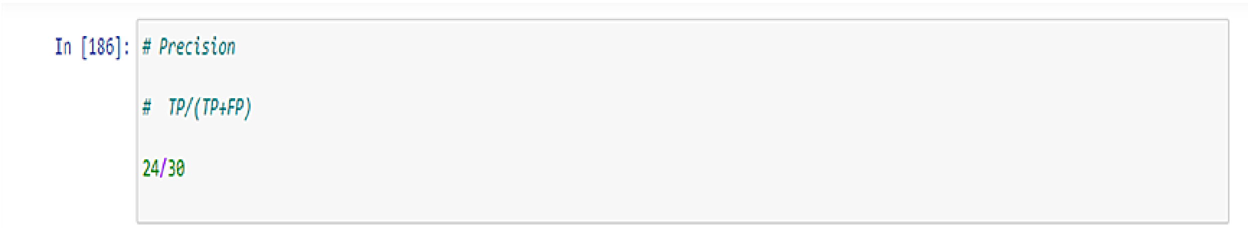


Evaluating the Model

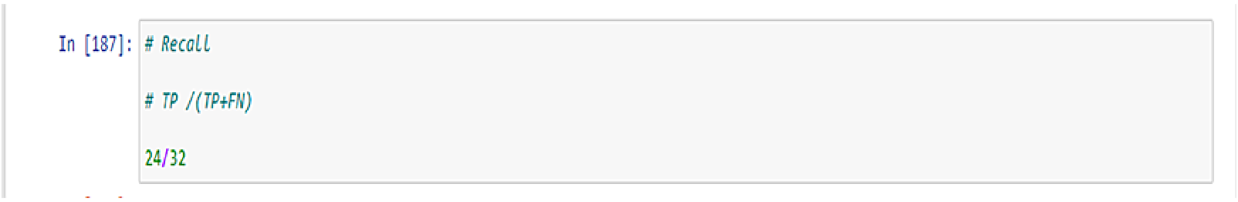
```
In [182]: # accuracy score

          from sklearn.metrics import accuracy_score,classification_report,confusion_matrix,roc_auc_score,roc_curve

In [247]: accuracy_score(y_test,pred_test) # test accuracy

Out[247]: 0.860606060606061

In [248]: # Confusion matrix

          pd.crosstab(y_test,pred_test)
```



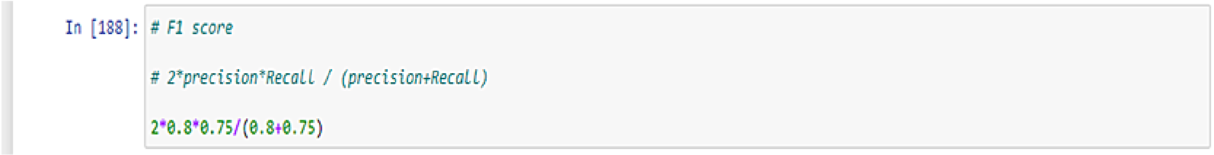
```
In [249]: # Classification report

          print(classification_report(y_test,pred_test))
```



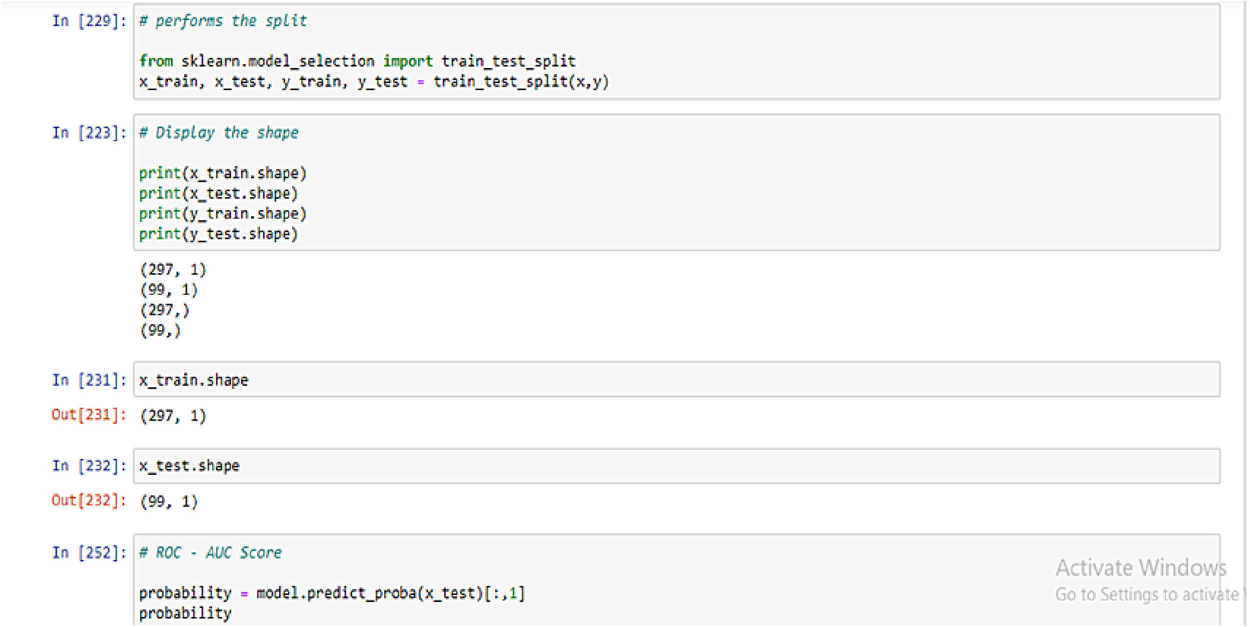
```
In [186]: # Precision

          #  TP/(TP+FP)

          24/30
```



```
In [187]: # Recall

          # TP /(TP+FN)

          24/32
```

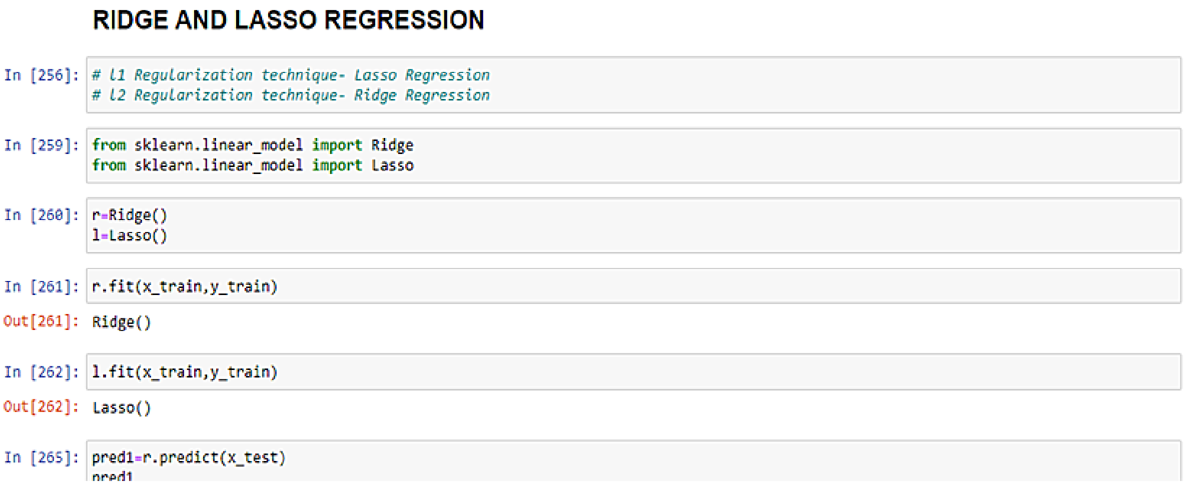


```
In [188]: # F1 score

          # 2*precision*Recall / (precision+Recall)

          2*0.8*0.75/(0.8+0.75)
```



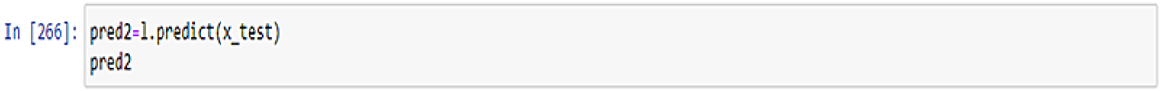
```
In [229]: # performs the split

          from sklearn.model_selection import train_test_split
          x_train, x_test, y_train, y_test = train_test_split(x,y)

In [223]: # Display the shape

          print(x_train.shape)
          print(x_test.shape)
          print(y_train.shape)
          print(y_test.shape)

          (297, 1)
          (99, 1)
          (297,)
          (99,)

In [231]: x_train.shape

Out[231]: (297, 1)

In [232]: x_test.shape

Out[232]: (99, 1)

In [252]: # ROC - AUC Score

          probability = model.predict_proba(x_test)[:,1]
          probability
```

Ridge and Lasso Regression:



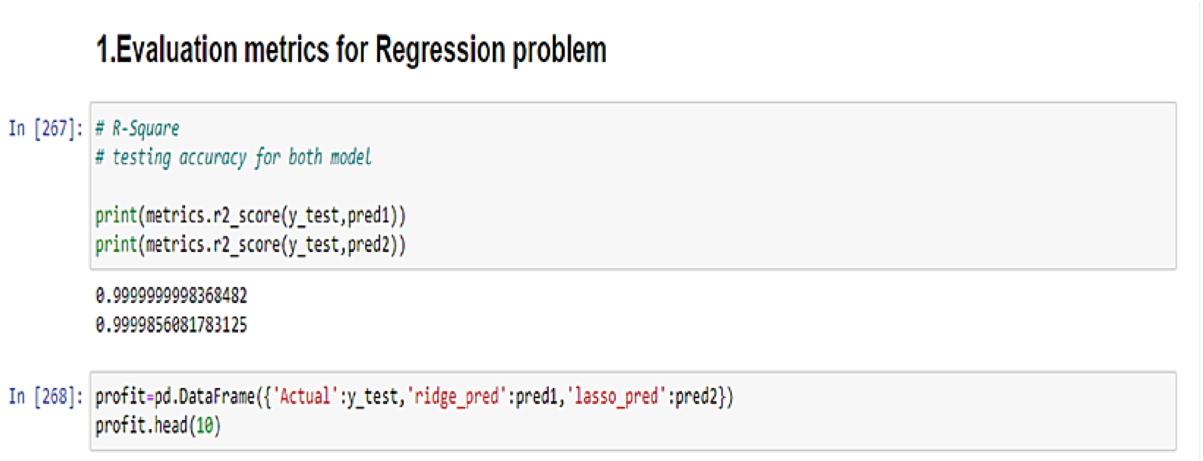
RIDGE AND LASSO REGRESSION

```
In [256]: # l1 Regularization technique- Lasso Regression
          # l2 Regularization technique- Ridge Regression

In [259]: from sklearn.linear_model import Ridge
          from sklearn.linear_model import Lasso

In [260]: r=Ridge()
          l=Lasso()

In [261]: r.fit(x_train,y_train)

Out[261]: Ridge()

In [262]: l.fit(x_train,y_train)

Out[262]: Lasso()

In [265]: pred1=r.predict(x_test)
          pred1
```



```
In [266]: pred2=l.predict(x_test)
          pred2
```

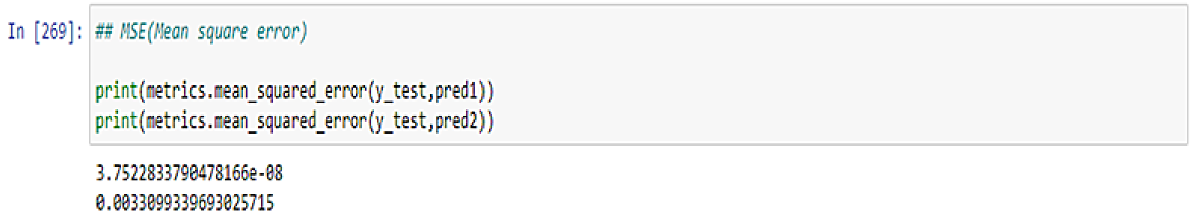
Evaluation Metrics for Regression:



1.Evaluation metrics for Regression problem

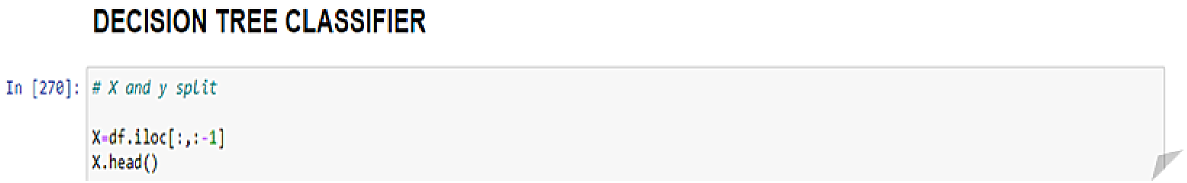
```
In [267]: # R-Square
          # testing accuracy for both model

          print(metrics.r2_score(y_test,pred1))
          print(metrics.r2_score(y_test,pred2))

          0.9999999998368482
          0.9999856081783125
```

```
In [268]: profit=pd.DataFrame({'Actual':y_test,'ridge_pred':pred1,'lasso_pred':pred2})
          profit.head(10)
```



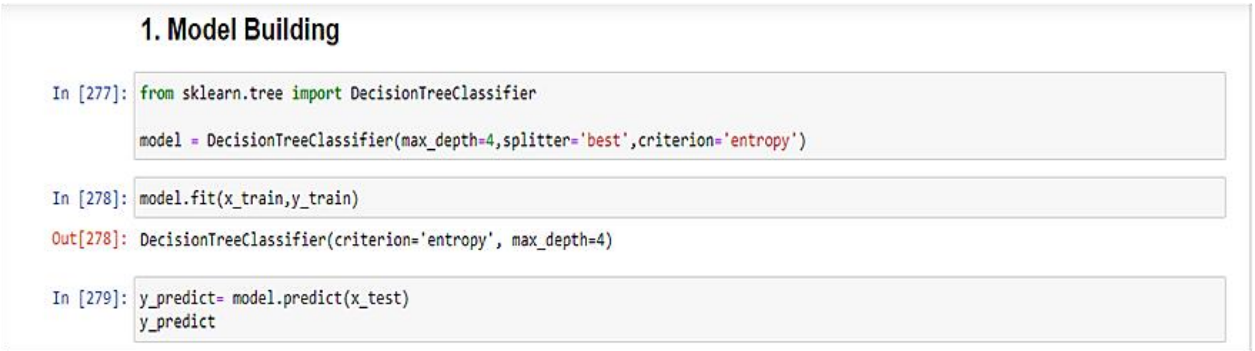
```
In [269]: ## MSE(Mean square error)

          print(metrics.mean_squared_error(y_test,pred1))
          print(metrics.mean_squared_error(y_test,pred2))

          3.7522833790478166e-08
          0.0033099339693025715
```

Decision Tree Classifier:



DECISION TREE CLASSIFIER

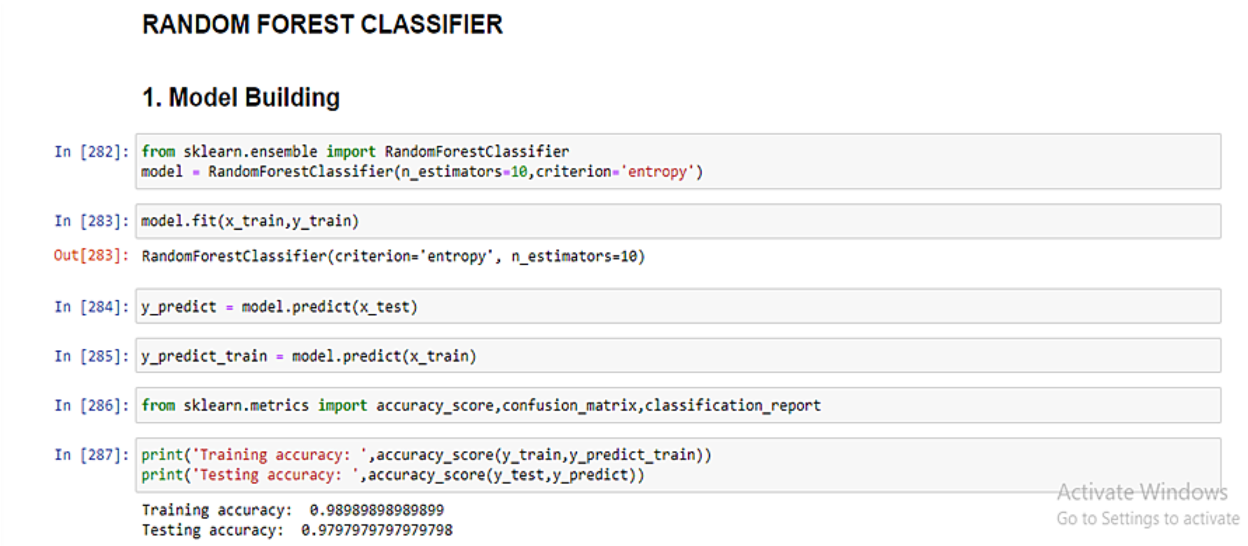
```
In [270]: # X and y split

          X=df.iloc[:,:-1]
          X.head()
```



1. Model Building

```
In [277]: from sklearn.tree import DecisionTreeClassifier

          model = DecisionTreeClassifier(max_depth=4,splitter='best',criterion='entropy')

In [278]: model.fit(x_train,y_train)

Out[278]: DecisionTreeClassifier(criterion='entropy', max_depth=4)

In [279]: y_predict= model.predict(x_test)
          y_predict
```

Random Forest Classifier:

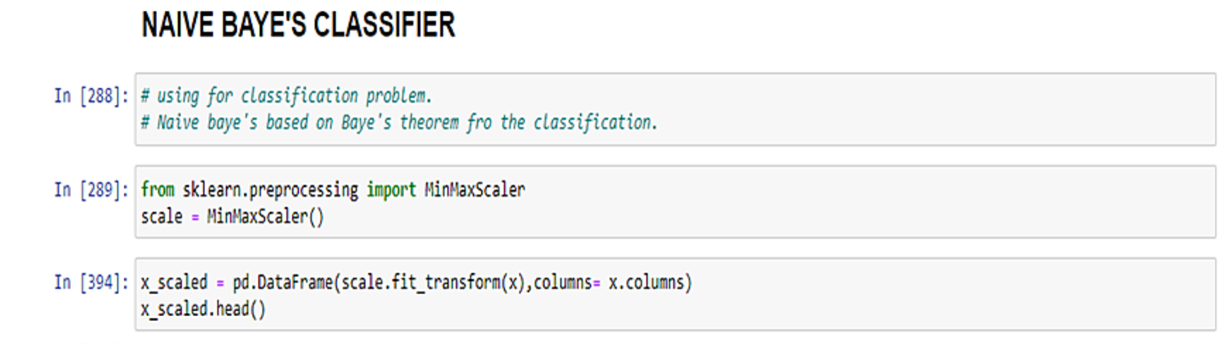


RANDOM FOREST CLASSIFIER

1. Model Building

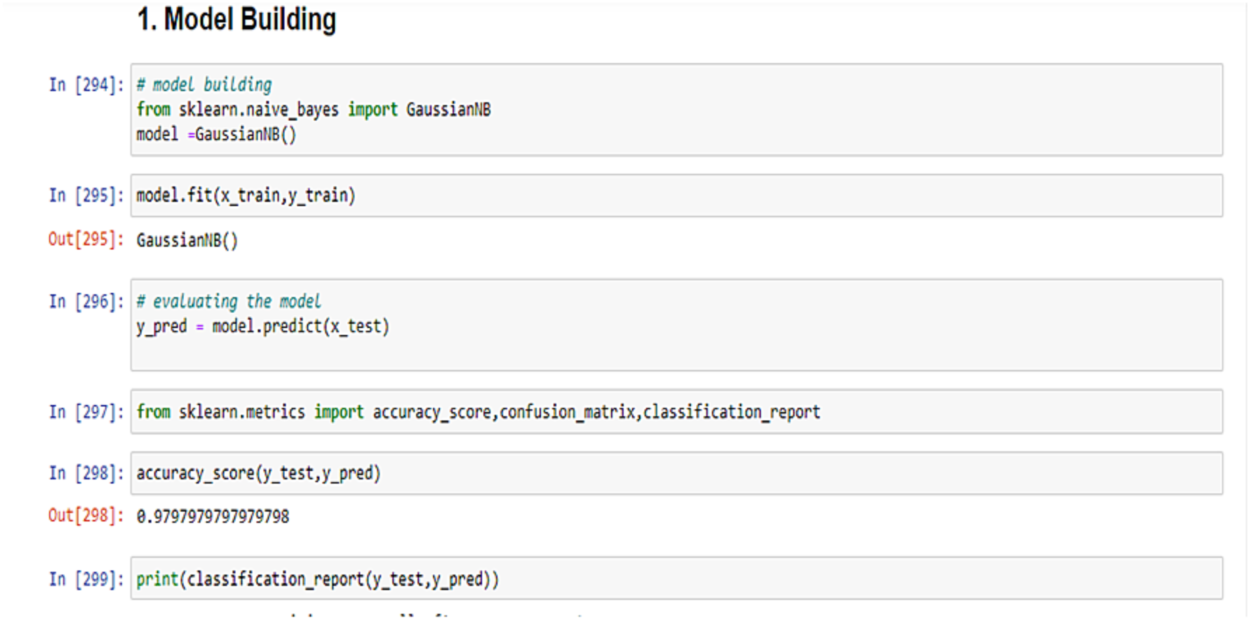
```
In [282]: from sklearn.ensemble import RandomForestClassifier
          model = RandomForestClassifier(n_estimators=10,criterion='entropy')

In [283]: model.fit(x_train,y_train)

Out[283]: RandomForestClassifier(criterion='entropy', n_estimators=10)

In [284]: y_predict = model.predict(x_test)

In [285]: y_predict_train = model.predict(x_train)

In [286]: from sklearn.metrics import accuracy_score,confusion_matrix,classification_report

In [287]: print('Training accuracy: ',accuracy_score(y_train,y_predict_train))
          print('Testing accuracy: ',accuracy_score(y_test,y_predict))

          Training accuracy:  0.98989898989899
          Testing accuracy:  0.9797979797979798
```

Naive Baye’s Classifier:



NAIVE BAYE'S CLASSIFIER

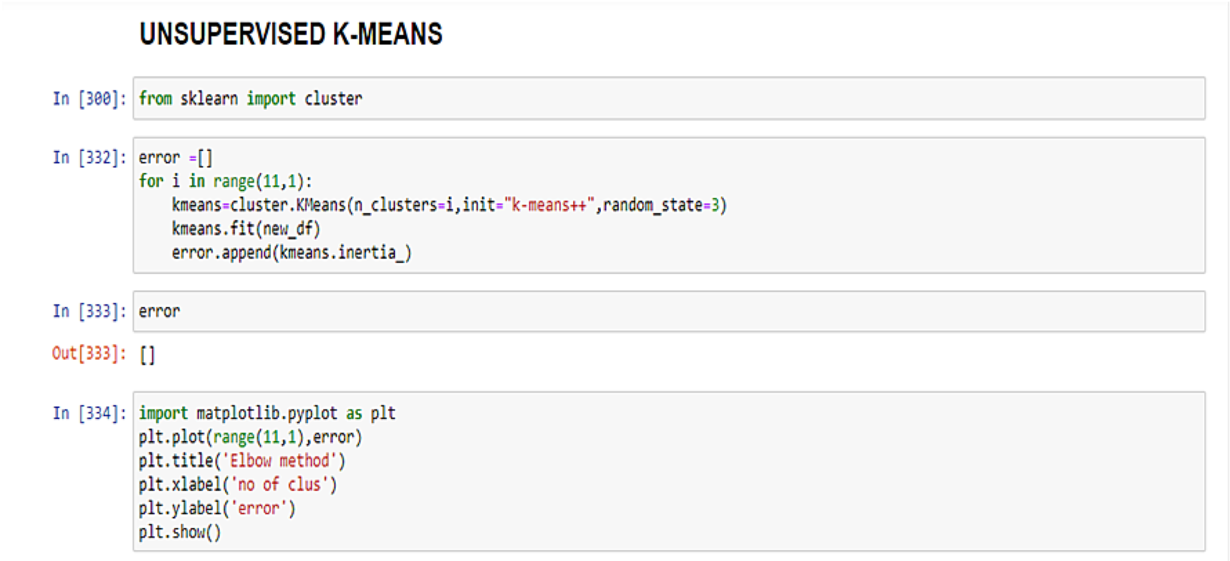
```
In [288]: # using for classification problem.
          # Naive baye's based on Baye's theorem fro the classification.

In [289]: from sklearn.preprocessing import MinMaxScaler
          scale = MinMaxScaler()

In [394]: x_scaled = pd.DataFrame(scale.fit_transform(x),columns= x.columns)
          x_scaled.head()
```



1. Model Building

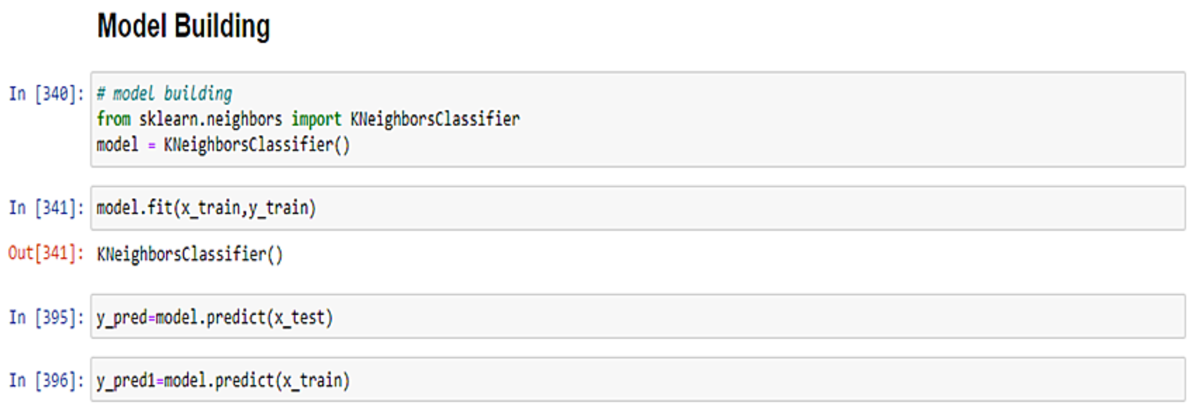
```
In [294]: # model building
          from sklearn.naive_bayes import GaussianNB
          model =GaussianNB()

In [295]: model.fit(x_train,y_train)

Out[295]: GaussianNB()

In [296]: # evaluating the model
          y_pred = model.predict(x_test)

In [297]: from sklearn.metrics import accuracy_score,confusion_matrix,classification_report

In [298]: accuracy_score(y_test,y_pred)

Out[298]: 0.9797979797979798

In [299]: print(classification_report(y_test,y_pred))
```

Unsupervised K-Means:



UNSUPERVISED K-MEANS

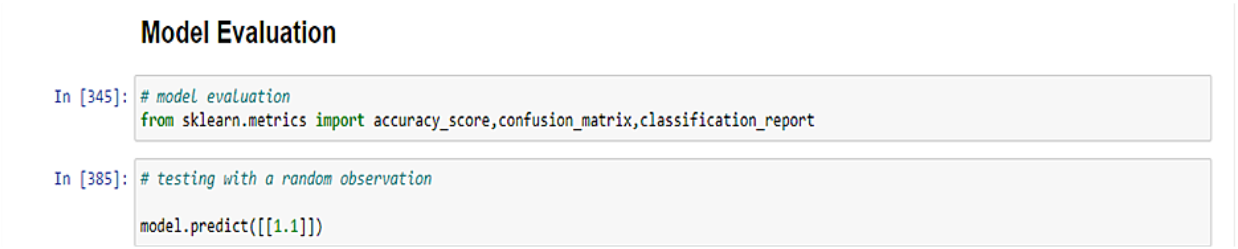
```
In [300]: from sklearn import cluster

In [332]: error =[]
          for i in range(11,1):
              kmeans=cluster.KMeans(n_clusters=i,init="k-means++",random_state=3)
              kmeans.fit(new_df)
              error.append(kmeans.inertia_)

In [333]: error

Out[333]: []

In [334]: import matplotlib.pyplot as plt
          plt.plot(range(11,1),error)
          plt.title('Elbow method')
          plt.xlabel('no of clus')
          plt.ylabel('error')
          plt.show()
```



Model Building

```
In [340]: # model building
          from sklearn.neighbors import KNeighborsClassifier
          model = KNeighborsClassifier()

In [341]: model.fit(x_train,y_train)

Out[341]: KNeighborsClassifier()

In [395]: y_pred=model.predict(x_test)

In [396]: y_pred1=model.predict(x_train)
```

Model Evaluation:



Model Evaluation

```
In [345]: # model evaluation
          from sklearn.metrics import accuracy_score,confusion_matrix,classification_report

In [385]: # testing with a random observation

          model.predict([[1.1]])
```

IBM CODING:

import numpy as np

import pandas as pd

from flask import Flask, render_template, request

import requests

import pickle

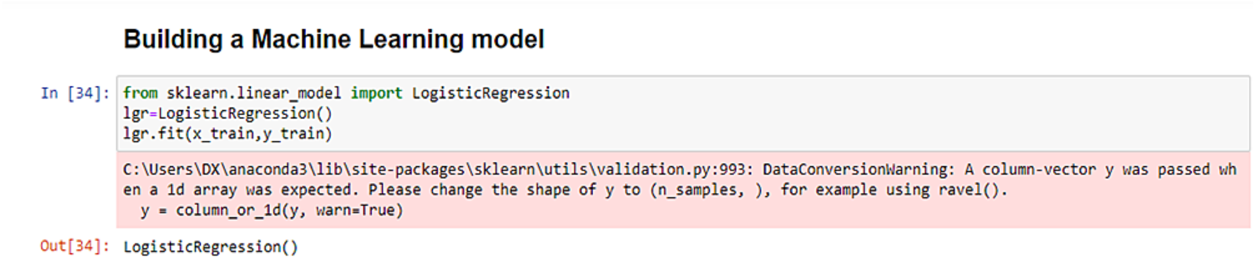
# NOTE: you must manually set API_KEY below using information retrieved

```
from your IBM Cloud account.
API_KEY = "QXCDaXxG__YG-
rHuYkTQwfeatR70SW8MTP9Lr29ORWNB"
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('CKD.pkl','rb'))

# NOTE: manually define and pass the array(s) of values to be scored in the
next line

app=Flask(__name__, template_folder='templates')

@app.route('/')
```

```
def index():

    return render_template('index.html')



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

def details():

    return render_template('details.html')



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

def awareness():

    return render_template('awareness.html')



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

def diagnosis():

    return render_template('diagnosis.html')





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

def prediction():

    return render_template('prediction.html')
```

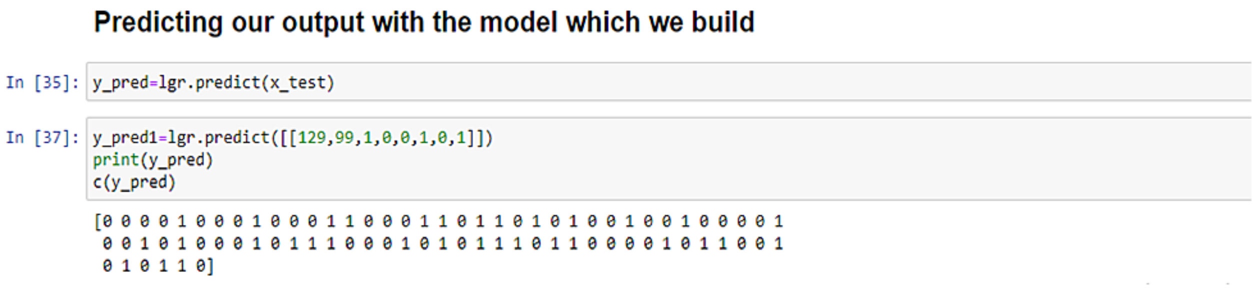
```
@app.route('/predict',methods=['POST','GET'])
def predict():

    input_features=[float(x) for x in request.form.values()]
    features_value=[np.array(input_features)]

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

    df=pd.DataFrame(features_value, columns=features_name)

    output=model.predict(df)

    #showing the prediction resultsin a UI# showing the prediction results in UI
    if output == 1:
        return render_template('success.html')
    else:
        return render_template('failure.html')
     payload_scoring = {"input_data":  [{"fields":
[['age','bp','sg','al','su','rbc','pc','pcc','ba','bgr','bu','sc','sod','pot','hemo','pcv','wc','rc
','htn','dm','cad','appet','pe','ane']], "values": features_name}]}
    response_scoring = requests.post('https://us-
south.ml.cloud.ibm.com/ml/v4/deployments/e0e99a97-2d3d-482b-bedf-
d1a5f97dfdc4/predictions?version=2022-11-12', json=payload_scoring,
    headers={'Authorization': 'Bearer ' + mltoken})
    print("Scoring response")
    print(response_scoring.json())
if__name__== '__main__':
    app.run(debug=True)
```

IBM DEPLOYMENT:



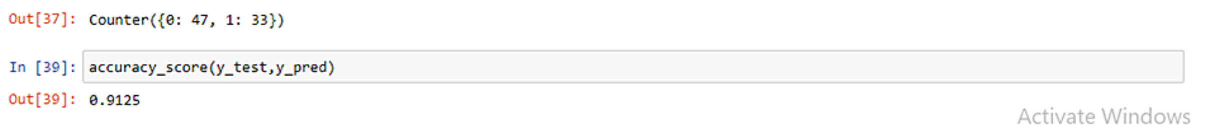
Building a Machine Learning model

```
In [34]: from sklearn.linear_model import LogisticRegression
         lgr=LogisticRegression()
         lgr.fit(x_train,y_train)

         C:\Users\DX\anaconda3\lib\site-packages\sklearn\utils\validation.py:993: DataConversionWarning: A column-vector y was passed wh
         en a 1d array was expected. Please change the shape of y to (n_samples, ), for example using ravel().
           y = column_or_1d(y, warn=True)

Out[34]: LogisticRegression()
```



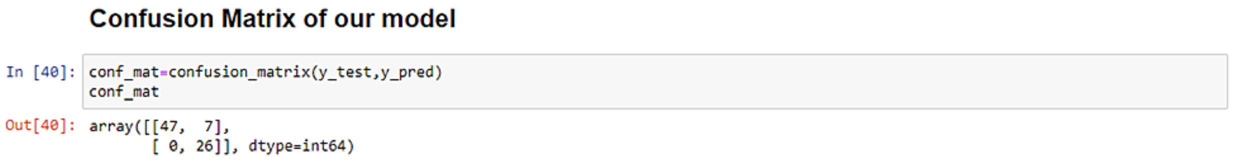
Predicting our output with the model which we build

```
In [35]: y_pred=lgr.predict(x_test)

In [37]: y_pred1=lgr.predict([[129,99,1,0,0,1,0,1]])
         print(y_pred)
         c(y_pred)

         [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 1 0 0 0 0 1
          0 0 1 0 1 0 0 0 1 0 1 1 1 0 0 0 1 0 1 0 1 1 1 0 1 1 0 0 0 0 1 0 1 1 0 0 1
          0 1 0 1 1 0]
```



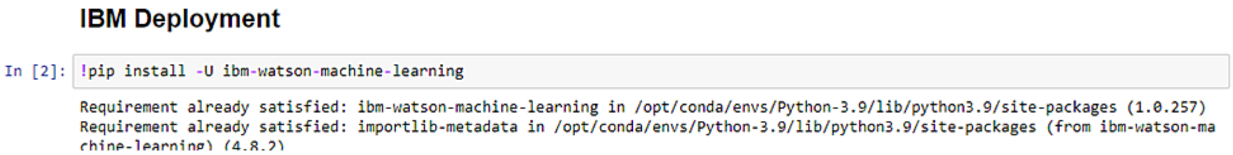
```
Out[37]: Counter({0: 47, 1: 33})

In [39]: accuracy_score(y_test,y_pred)

Out[39]: 0.9125
```

Activate Windows



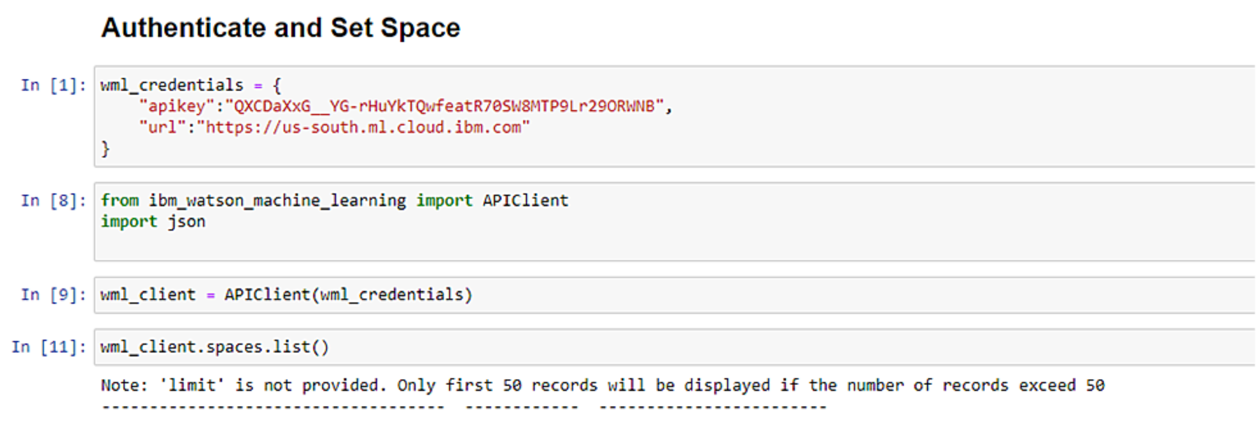
Confusion Matrix of our model

```
In [40]: conf_mat=confusion_matrix(y_test,y_pred)
         conf_mat

Out[40]: array([[47,  7],
                [ 0, 26]], dtype=int64)
```



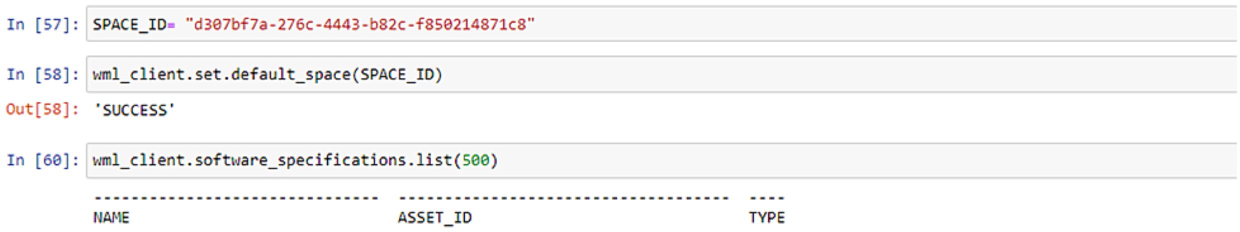
IBM Deployment

```
In [2]: !pip install -U ibm-watson-machine-learning

        Requirement already satisfied: ibm-watson-machine-learning in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (1.0.257)
        Requirement already satisfied: importlib-metadata in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-watson-ma
        chine-learning) (4.8.2)
```

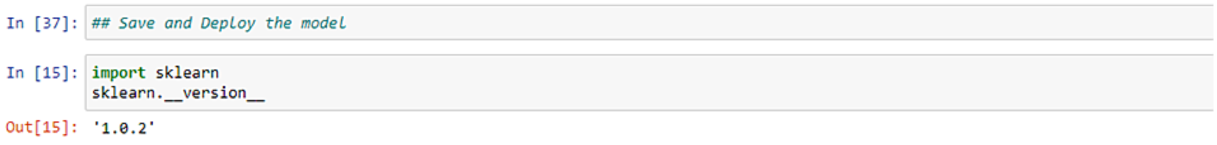


Authenticate and Set Space

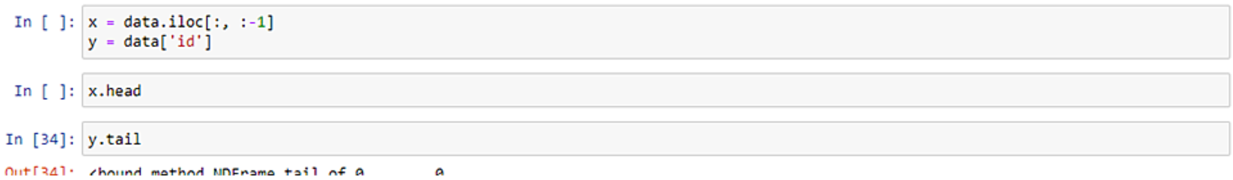
```
In [1]: wml_credentials = {
            "apikey":"QXCDaXxG__YG-rHuYkTQwfeatR70SW8MTP9Lr29ORWNB",
            "url":"https://us-south.ml.cloud.ibm.com"
        }

In [8]: from ibm_watson_machine_learning import APIClient
        import json

In [9]: wml_client = APIClient(wml_credentials)

In [11]: wml_client.spaces.list()

         Note: 'limit' is not provided. Only first 50 records will be displayed if the number of records exceed 50
         ------------------------------------  ------------  ------------------------
```



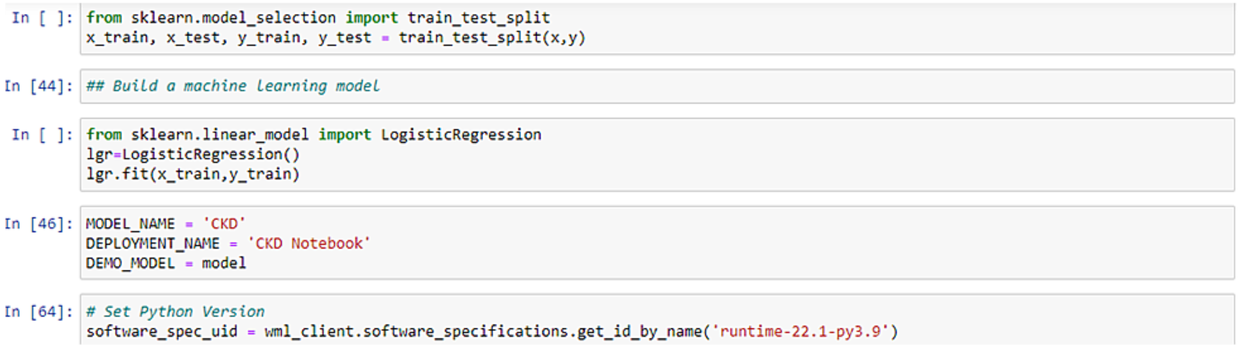
```
In [57]: SPACE_ID= "d307bf7a-276c-4443-b82c-f850214871c8"

In [58]: wml_client.set.default_space(SPACE_ID)

Out[58]: 'SUCCESS'

In [60]: wml_client.software_specifications.list(500)

         ------------------------------  -----------------------------------  ----
         NAME                            ASSET_ID                             TYPE
```



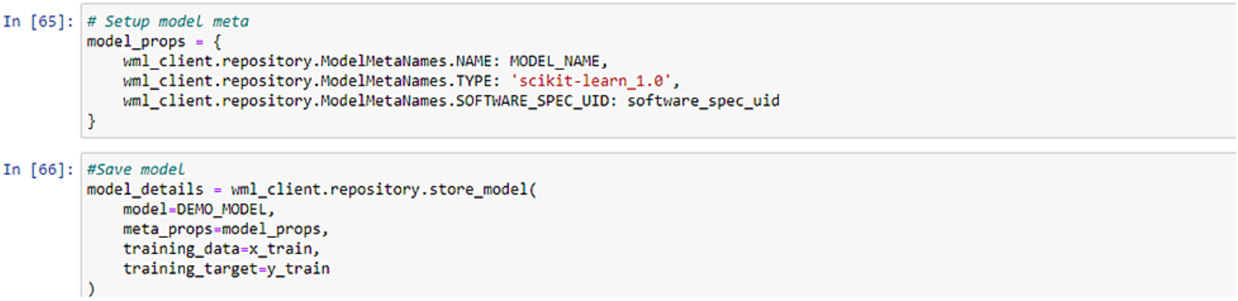
```
In [37]: ## Save and Deploy the model

In [15]: import sklearn
         sklearn.__version__

Out[15]: '1.0.2'
```



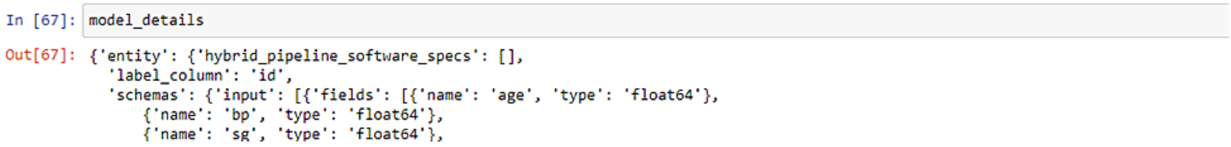
```
In [ ]: x = data.iloc[:, :-1]
        y = data['id']

In [ ]: x.head

In [34]: y.tail

Out[34]: <bound method NDFrame.tail of 0         0
```



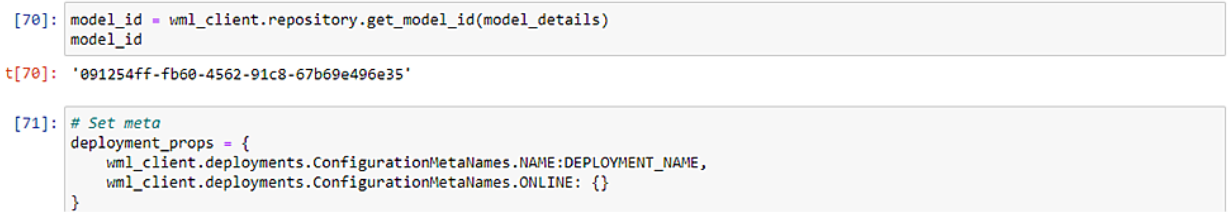
```
In [ ]: from sklearn.model_selection import train_test_split
        x_train, x_test, y_train, y_test = train_test_split(x,y)

In [44]: ## Build a machine learning model

In [ ]: from sklearn.linear_model import LogisticRegression
        lgr=LogisticRegression()
        lgr.fit(x_train,y_train)

In [46]: MODEL_NAME = 'CKD'
         DEPLOYMENT_NAME = 'CKD Notebook'
         DEMO_MODEL = model

In [64]: # Set Python Version
         software_spec_uid = wml_client.software_specifications.get_id_by_name('runtime-22.1-py3.9')
```



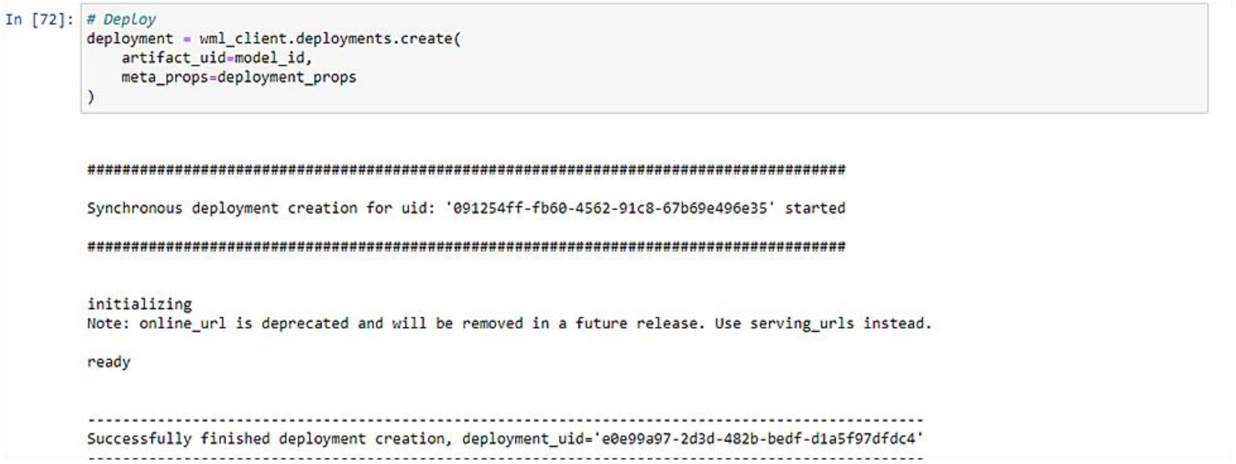
```
In [65]: # Setup model meta
         model_props = {
             wml_client.repository.ModelMetaNames.NAME: MODEL_NAME,
             wml_client.repository.ModelMetaNames.TYPE: 'scikit-learn_1.0',
             wml_client.repository.ModelMetaNames.SOFTWARE_SPEC_UID: software_spec_uid
         }

In [66]: #Save model
         model_details = wml_client.repository.store_model(
             model=DEMO_MODEL,
             meta_props=model_props,
             training_data=x_train,
             training_target=y_train
         )
```



```
In [67]: model_details

Out[67]: {'entity': {'hybrid_pipeline_software_specs': [],
           'label_column': 'id',
           'schemas': {'input': [{'fields': [{'name': 'age', 'type': 'float64'},
               {'name': 'bp', 'type': 'float64'},
               {'name': 'sg', 'type': 'float64'},
```



```
[70]: model_id = wml_client.repository.get_model_id(model_details)
      model_id

t[70]: '091254ff-fb60-4562-91c8-67b69e496e35'

[71]: # Set meta
      deployment_props = {
          wml_client.deployments.ConfigurationMetaNames.NAME:DEPLOYMENT_NAME,
          wml_client.deployments.ConfigurationMetaNames.ONLINE: {}
      }
```



```
In [72]: # Deploy
         deployment = wml_client.deployments.create(
             artifact_uid=model_id,
             meta_props=deployment_props
         )


         #######################################################################################

         Synchronous deployment creation for uid: '091254ff-fb60-4562-91c8-67b69e496e35' started

         #######################################################################################


         initializing
         Note: online_url is deprecated and will be removed in a future release. Use serving_urls instead.

         ready


         ------------------------------------------------------------------------------------------------
         Successfully finished deployment creation, deployment_uid='e0e99a97-2d3d-482b-bedf-d1a5f97dfdc4'
         ------------------------------------------------------------------------------------------------
```

GitHub and Project Demo Link

GitHub Link: https://github.com/IBM-EPBL/IBM-Project-54113-1661597336

Demo Link : **google drive**