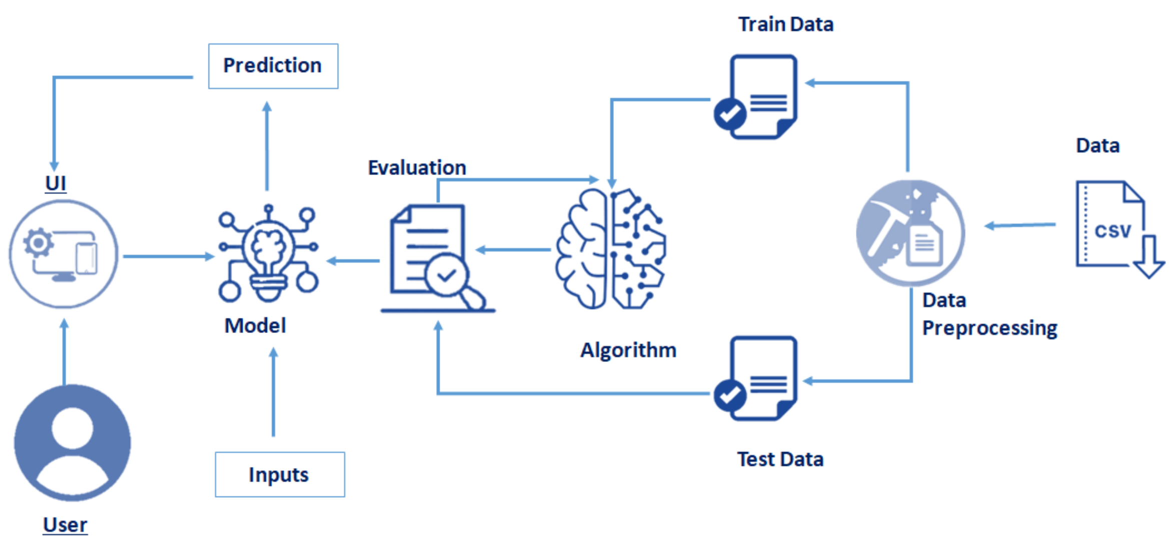
EARLY PREDICTION OF CHRONIC KIDNEY DISEASE

1.INTRODUCTION:

1.1 Overview:

Chronic Kidney Disease (CKD) is a major medical problem and can be cured if treated in the early stages. Usually, people are not aware that medical tests, we take for different purposes could contain valuable information concerning kidney diseases. Consequently, attributes of various medical tests are investigated to distinguish which attributes may contain helpful information about the disease. The information says that it helps us to measure the severity of the problem and we make use of such information to build a machine learning model that predicts Chronic Kidney Disease

Technical Architecture:



1.2 Purpose:

- You'll be able to understand the problem to classify if it is a regression or a classification kind of problem.
- You will be able to know how to pre-process/clean the data using different data pre-processing techniques.
- You will be able to analyze or get insights from data through visualization.
- Applying different algorithms according to the dataset
- You will be able to know how to find the accuracy of the model.
- You will be able to Build web applications using Flask
- You will be able to know how to build a web application using the Flask framework.

2 LITERATURE SURVEY:

2.1 Existing Problem

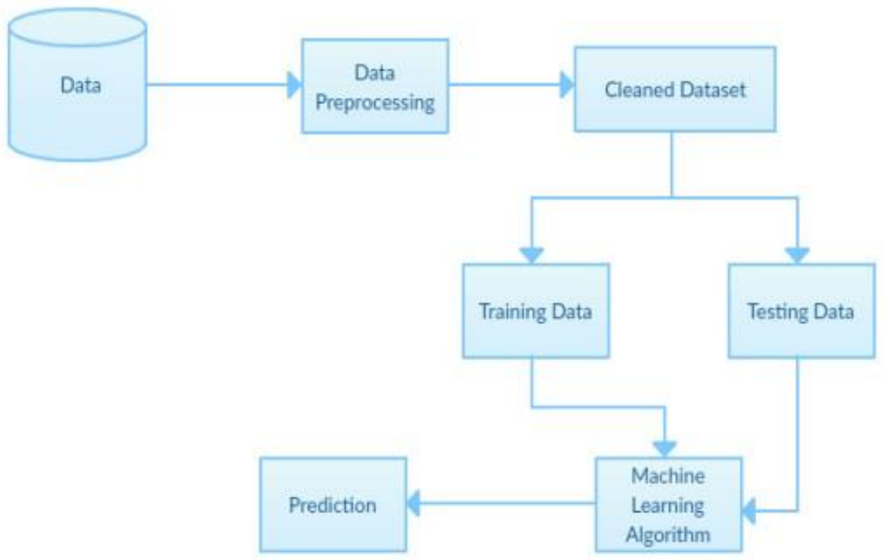
- **Existing models didn't give accurate results.**
- **The time taken to predict the result is more.**

2.2 Proposed Solution

- **By using Logistic Regression techniques and by importing some packages like numpy, pandas, flask, scikit etc.**
- **By splitting the data into training data and testing data.**
- **We are going to solve the existing system problems.**

3 THEORITICAL ANALYSIS:

3.1 Block Diagram



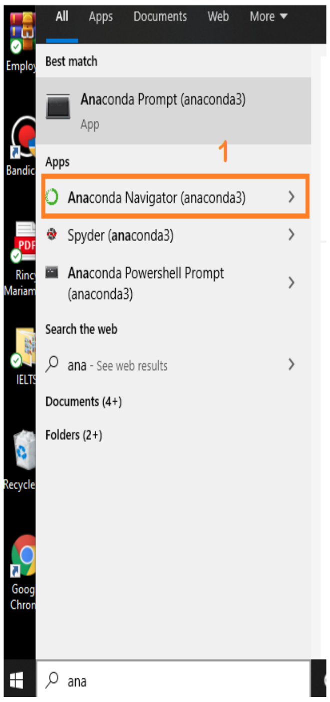
3.2 Hardware/Software designing

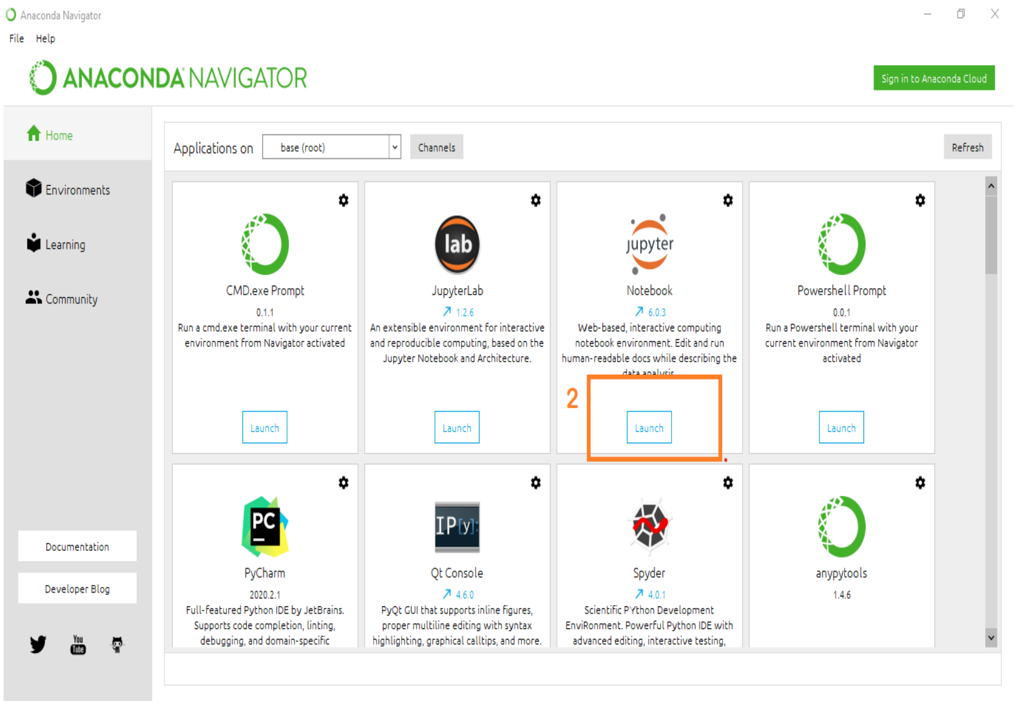
To complete this project, you must require following software's concepts and packages

- **Anaconda navigator:**
  - Refer to the link below to download anaconda navigator
  - **Link : https://www.youtube.com/watch?v=5mDYijMfSzs**
- **Python packages:** Open anaconda prompt as administrator.
  - Type "pip install numpy" and click enter.
  - Type "pip install pandas" and click enter.
  - Type "pip install matplotlib" and click enter.
  - Type "pip install scikit-learn" and click enter.
  - Type "pip install Flask" and click enter.
  - Type "pip install missingno" and click enter.

The above steps allow you to install the packages in the anaconda environment

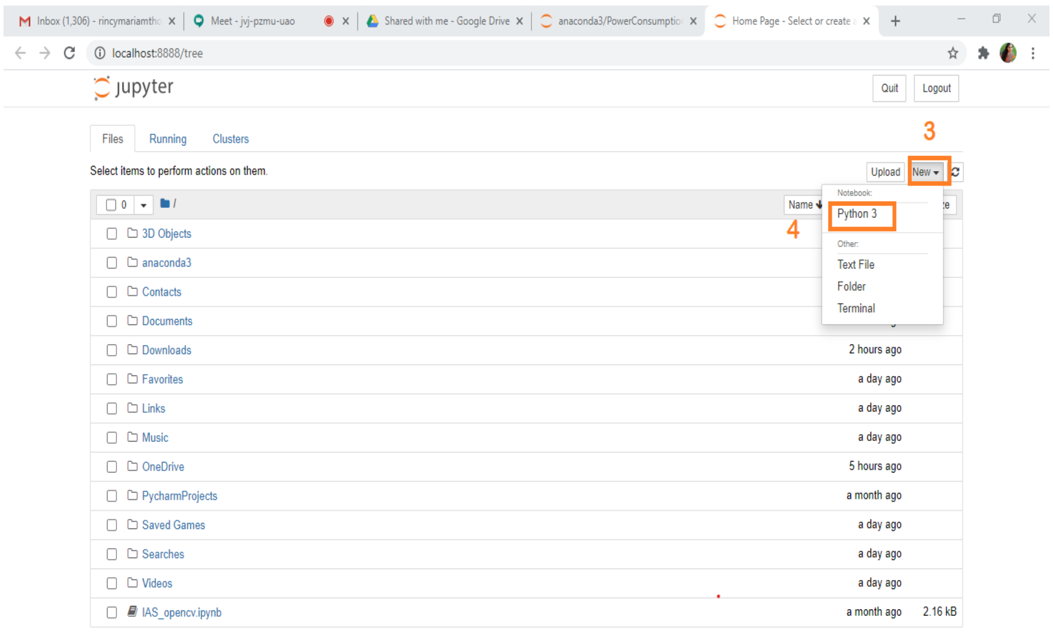
- **Launch Jupyter**
  - Search for Anaconda Navigator and open Launch Jupyter notebook.




Anaconda Navigator
File Help
ANACONDA NAVIGATOR
Sign in to Anaconda Cloud
Home
Environments
Learning
Community
Applications on
base (root)
Channels
Refresh
CMD.exe Prompt
0.1.1
Run a cmd.exe terminal with your current environment from Navigator activated
Launch
JupyterLab
1.2.6
An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.
Launch
Notebook
6.0.3
Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.
2
Launch
Powershell Prompt
0.0.1
Run a Powershell terminal with your current environment from Navigator activated
Launch
PyCharm
2020.2.1
Full-featured Python IDE by JetBrains. Supports code completion, linting, debugging, and domain-specific
Qt Console
4.6.0
PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.
Spyder
4.0.1
Scientific PYthon Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing,
anypytools
1.4.6
Documentation
Developer Blog

  - Then you will be able to see that the jupyter notebook runs on local host:8888.

- To Create a new file Go to New →Python3.The file in jupyter notebook is saved with .ipynb extension.

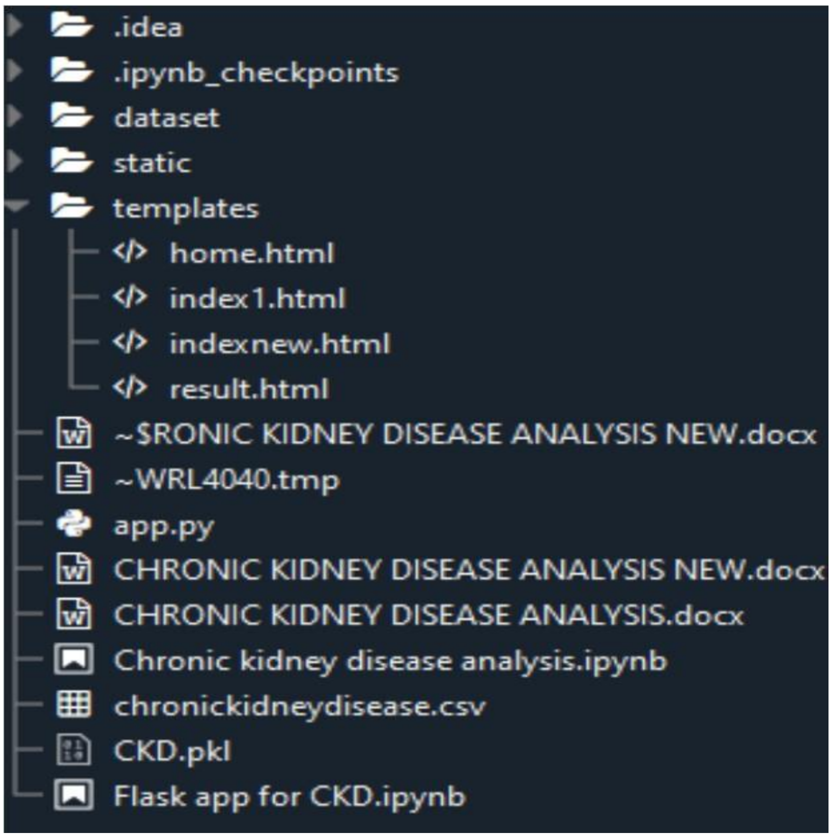


Select items to perform actions on them.

3D Objects		
anaconda3		
Contacts		
Documents		
Downloads	2 hours ago	
Favorites	a day ago	
Links	a day ago	
Music	a day ago	
OneDrive	5 hours ago	
PycharmProjects	a month ago	
Saved Games	a day ago	
Searches	a day ago	
Videos	a day ago	
IAS_opencv.ipynb	a month ago	2.16 kB

4 EXPERIMENTAL INVESTIGATIONS:

Create a Project folder which contains files as shown below



```
.idea
.ipynb_checkpoints
dataset
static
templates
    home.html
    index1.html
    indexnew.html
    result.html
~$RONIC KIDNEY DISEASE ANALYSIS NEW.docx
~WRL4040.tmp
app.py
CHRONIC KIDNEY DISEASE ANALYSIS NEW.docx
CHRONIC KIDNEY DISEASE ANALYSIS.docx
Chronic kidney disease analysis.ipynb
chronickidneydisease.csv
CKD.pkl
Flask app for CKD.ipynb
```

- A python file called app.py for server side scipting.

- We need the model which is saved and the saved model in this content is CKD.pkl
- Templates folder which contains home.HTML file, index.HTML file, result.HTML file.
- Static folder which contains css folder which contains style.css , styles.css .

Milestone 1: Data Collection:

ML depends heavily on data, without data, it is impossible for an “AI” to learn. It is the most crucial aspect that makes algorithm training possible. In Machine Learning projects, we need a training **data set.** It is the actual **data set** used to train the model for performing various actions.

Activity1: Download The dataset

You can collect datasets from different open sources like kaggle.com, data.gov, UCI machine learning repository etc.

The dataset used for this project was obtained from Kaggle .

Milestone 2: Data Preprocessing

Data Pre-processing includes the following main tasks

- Import the Libraries.
- Importing the dataset.
- Checking for Null Values.
- Data Visualization.
- Label Encoding.
- Splitting Data into Train and Test.

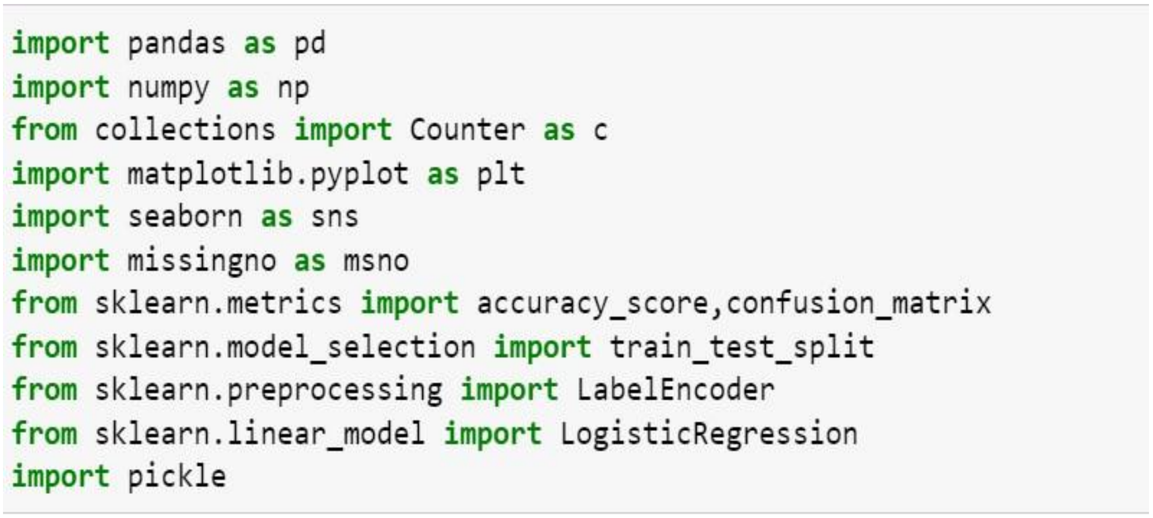
Activity 1: Import Necessary Libraries

- **Sklearn:** Scikit-learn is a library in Python that provides many unsupervised and supervised learning algorithms.

- **NumPy:** NumPy is a Python package that stands for 'Numerical Python'. It is the core library for scientific computing, which contains a powerful n-dimensional array object

- **Pandas:** pandas is a fast, powerful, flexible, and easy to use open source data analysis and manipulation tool,built on top of the Python programming language.

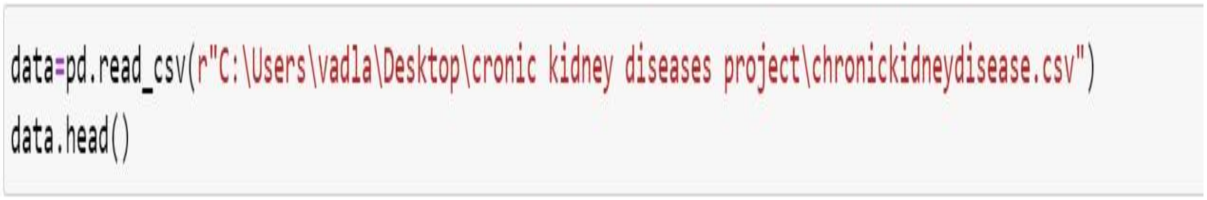
- **Matplotlib:** It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits



```python
import pandas as pd
import numpy as np
from collections import Counter as c
import matplotlib.pyplot as plt
import seaborn as sns
import missingno as msno
from sklearn.metrics import accuracy_score,confusion_matrix
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.linear_model import LogisticRegression
import pickle
```

Activity 2: Importing the Dataset

- You might have your data in .csv files, .excel files
- Let’s load a .csv data file into pandas using **read_csv() function.**We will need to locate the directory of the CSV file at first (it’s more efficient to keep the dataset in the same directory as your program).



```python
data=pd.read_csv(r"C:\Users\vadla\Desktop\cronic kidney diseases project\chronickidneydisease.csv")
data.head()
```

- If your dataset is in some other location ,Then

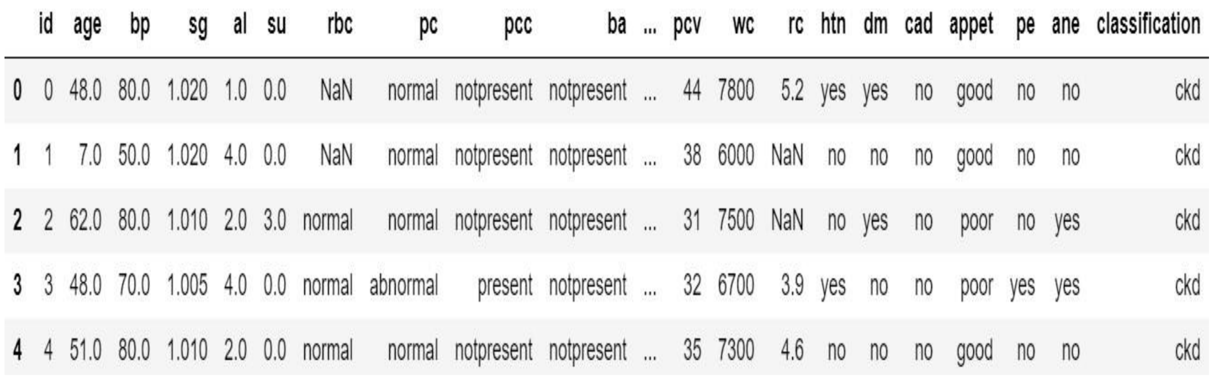
  Data=pd.read_csv(r”File_location”)

  Note:r stands for "raw" and will cause backslashes in the string to be interpreted as actual backslashes rather than special characters.

- If the dataset in same directory of your program, you can directly read it, without giving raw as r.

Activity 3: Analyse the data

- head() method is used to return top n (5 by default) rows of a DataFrame or series.



	id	age	bp	sg	al	su	rbc	pc	pcc	ba	...	pcv	wc	rc	htn	dm	cad	appet	pe	ane	classification
0	0	48.0	80.0	1.020	1.0	0.0	NaN	normal	notpresent	notpresent	...	44	7800	5.2	yes	yes	no	good	no	no	ckd
1	1	7.0	50.0	1.020	4.0	0.0	NaN	normal	notpresent	notpresent	...	38	6000	NaN	no	no	no	good	no	no	ckd
2	2	62.0	80.0	1.010	2.0	3.0	normal	normal	notpresent	notpresent	...	31	7500	NaN	no	yes	no	poor	no	yes	ckd
3	3	48.0	70.0	1.005	4.0	0.0	normal	abnormal	present	notpresent	...	32	6700	3.9	yes	no	no	poor	yes	yes	ckd
4	4	51.0	80.0	1.010	2.0	0.0	normal	normal	notpresent	notpresent	...	35	7300	4.6	no	no	no	good	no	no	ckd

- info() gives information about the data

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 400 entries, 0 to 399
Data columns (total 25 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   age                      391 non-null    float64
 1   blood_pressure           388 non-null    float64
 2   specific_gravity         353 non-null    float64
 3   albumin                  354 non-null    float64
 4   sugar                    351 non-null    float64
 5   red_blood_cells          248 non-null    object
 6   pus_cell                 335 non-null    object
 7   pus_cell_clumps          396 non-null    object
 8   bacteria                 396 non-null    object
 9   blood glucose random     356 non-null    float64
 10  blood_urea               381 non-null    float64
 11  serum_creatinine         383 non-null    float64
 12  sodium                   313 non-null    float64
 13  potassium                312 non-null    float64
 14  hemoglobin               348 non-null    float64
 15  packed_cell_volume       330 non-null    object
 16  white_blood_cell_count   295 non-null    object
 17  red_blood_cell_count     270 non-null    object
 18  hypertension             398 non-null    object
 19  diabetesemellitus        398 non-null    object
 20  coronary_artery_disease  398 non-null    object
 21  appetite                 399 non-null    object
 22  pedal_edema              399 non-null    object
 23  anemia                   399 non-null    object
 24  class                    400 non-null    object
dtypes: float64(11), object(14)
```

- `memory usage: 78.2+ KB`

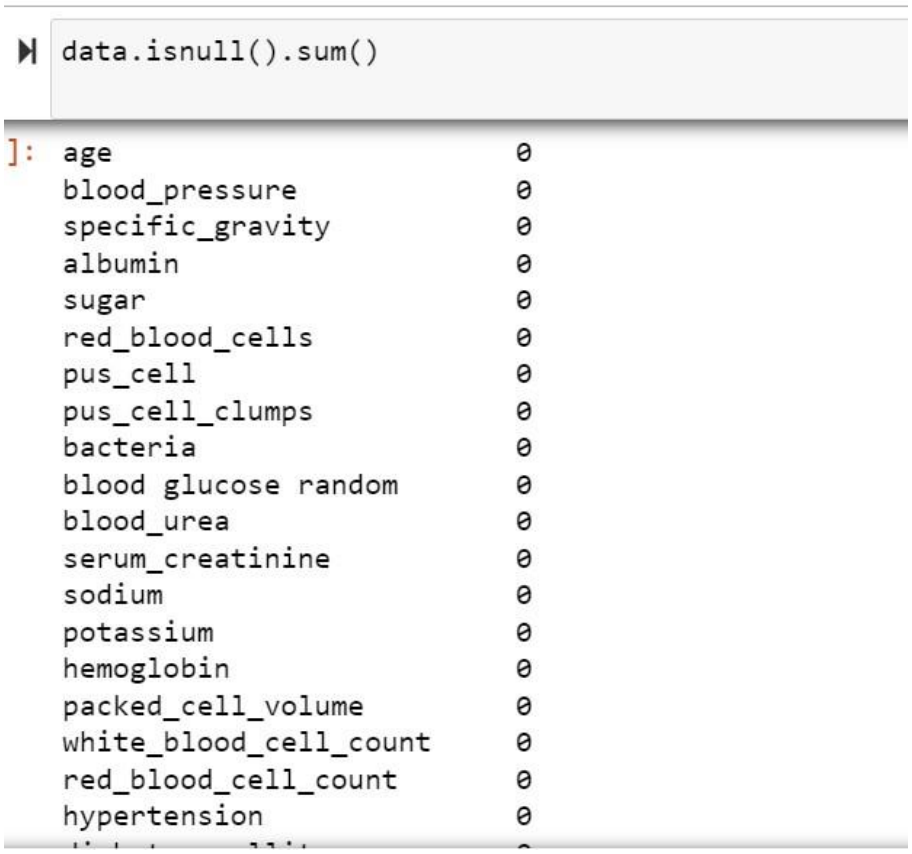
Activity 4: Handling Missing Values

1. After loading it is important to check the complete information of data as it can indication many of the hidden infomation such as null values in a column or a row

2.Check whether any null values are there or not. if it is present then following can be done,

a.Imputing data using Imputation method in sklearn

b.Filling NaN values with mean, median and mode using fillna() method.



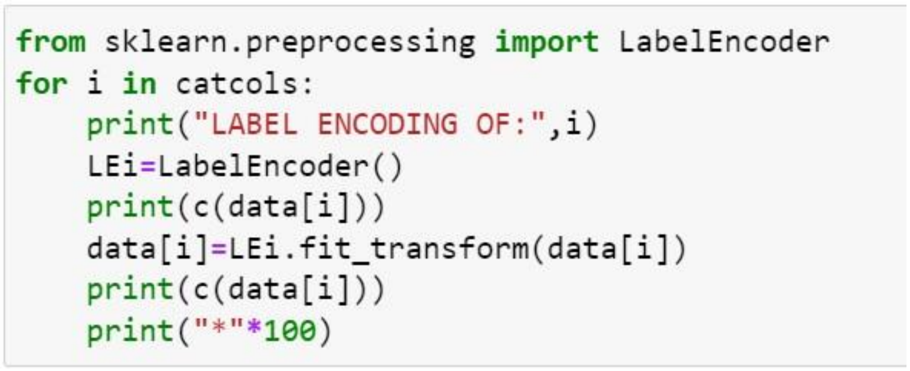
```
data.isnull().sum()
```

```
]: age                        0
   blood_pressure             0
   specific_gravity           0
   albumin                    0
   sugar                      0
   red_blood_cells            0
   pus_cell                   0
   pus_cell_clumps            0
   bacteria                   0
   blood glucose random       0
   blood_urea                 0
   serum_creatinine           0
   sodium                     0
   potassium                  0
   hemoglobin                 0
   packed_cell_volume         0
   white_blood_cell_count     0
   red_blood_cell_count       0
   hypertension               0
```

Activity 6: Label Encoding

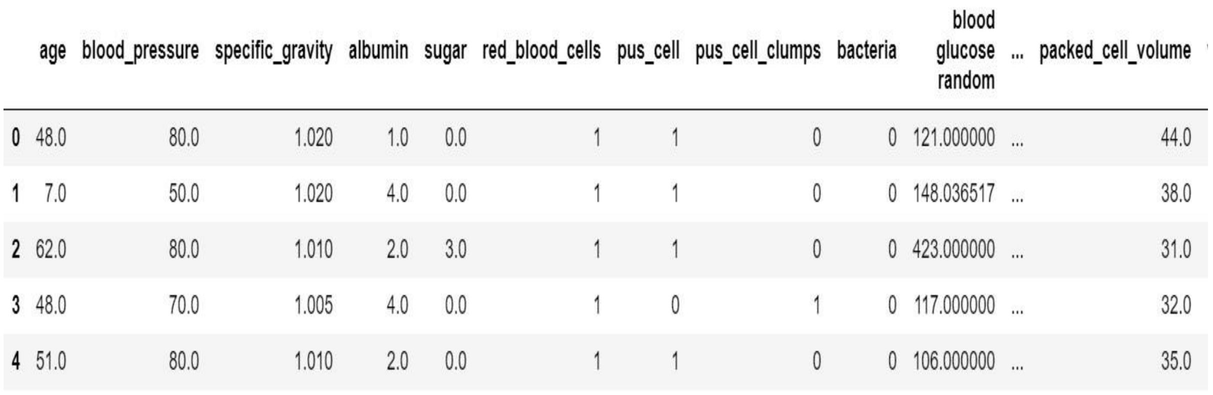
In machine learning, we usually deal with datasets which contains multiple labels in one or more than one columns. These labels can be in the form of words or numbers. To make the data understandable or in human readable form, the training data is often labelled in words.

Label Encoding refers to converting the labels into numeric form so as to convert it into the machine-readable form. Machine learning algorithms can then decide in a better way on how those labels must be operated. It is an important pre-processing step for the structured dataset in supervised learning.



```
from sklearn.preprocessing import LabelEncoder
for i in catcols:
    print("LABEL ENCODING OF:",i)
    LEi=LabelEncoder()
    print(c(data[i]))
    data[i]=LEi.fit_transform(data[i])
    print(c(data[i]))
    print("*"*100)
```

Data after label encoding



	age	blood_pressure	specific_gravity	albumin	sugar	red_blood_cells	pus_cell	pus_cell_clumps	bacteria	blood glucose random	...	packed_cell_volume
0	48.0	80.0	1.020	1.0	0.0	1	1	0	0	121.000000	...	44.0
1	7.0	50.0	1.020	4.0	0.0	1	1	0	0	148.036517	...	38.0
2	62.0	80.0	1.010	2.0	3.0	1	1	0	0	423.000000	...	31.0
3	48.0	70.0	1.005	4.0	0.0	1	0	1	0	117.000000	...	32.0
4	51.0	80.0	1.010	2.0	0.0	1	1	0	0	106.000000	...	35.0

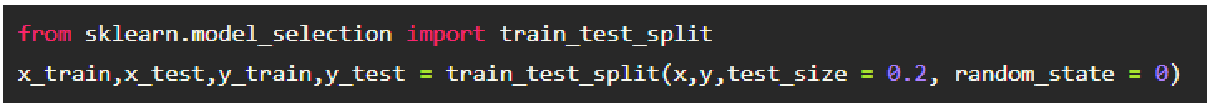
All the data is converted into numerical values.

Activity 9: Splitting the data into Train and Test

- When you are working on a model and you want to train it, you obviously have a dataset. But after training, we have to test the model on some test dataset. For this, you will a dataset which is different from the training set you used earlier. But it might not always be possible to have so much data during the development phase. In such cases, the solution is to split the dataset into two sets, one for training and the other for testing.
- But the question is, how do you split the data? You can't possibly manually split the dataset into two sets. And you also have to make sure you split the data in a random manner. To help us with this task, the Scikit library provides a tool, called the Model Selection library. There is a class in the library which is,**'train_test_split.'** Using this we

can easily split the dataset into the training and the testing datasets in various proportions.

- The train-test split is a technique for evaluating the performance of a machine learning algorithm.
- **Train Dataset**: Used to fit the machine learning model.
- **Test Dataset**: Used to evaluate the fit machine learning model.
- In general you can allocate 80% of the dataset to training set and the remaining 20% to test set.We will create 4 sets— X_train (training part of the matrix of features), X_test (test part of the matrix of features), Y_train (training part of the dependent variables associated with the X train sets, and therefore also the same indices), Y_test (test part of the dependent variables associated with the X test sets, and therefore also the same indices.
- There are a few other parameters that we need to understand before we use the class:
- **test_size** — this parameter decides the size of the data that has to be split as the test dataset. This is given as a fraction. For example, if you pass 0.5 as the value, the dataset will be split 50% as the test dataset
- **train_size** — you have to specify this parameter only if you're not specifying the test_size. This is the same as test_size, but instead you tell the class what percent of the dataset you want to split as the training set.
- **random_state** — here you pass an integer, which will act as the seed for the random number generator during the split. Or, you can also pass an instance of the Random_state class, which will become the number generator. If you don't pass anything, the Random_state instance used by np.random will be used instead.
- Now split our dataset into train set and test using train_test_split class from scikit learn library.

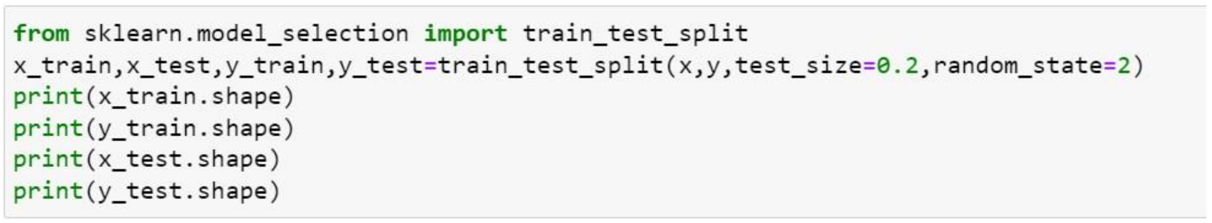


```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size = 0.2, random_state = 0)
```

Activity 10: Feature Scaling

There is huge disparity between the x values so let us use feature scaling.

Feature scaling is a method used to normalize the range of independent variables or features of data.



```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=2)
print(x_train.shape)
print(y_train.shape)
print(x_test.shape)
print(y_test.shape)
```

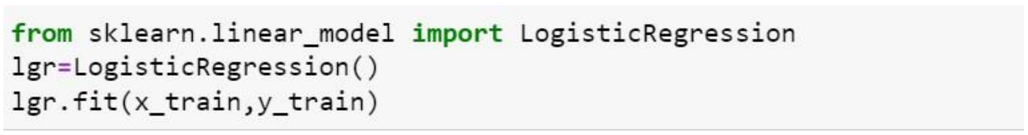
Milestone 3: Model Buiding:

Model building includes the following main tasks

- Import the model building Libraries
- Initializing the model
- Training and testing the model
- Evaluation of Model
- Save the Model

Activity 1: Training and Testing the Model

We are using the algorithm from Scikit learn library to build the model as shown below,

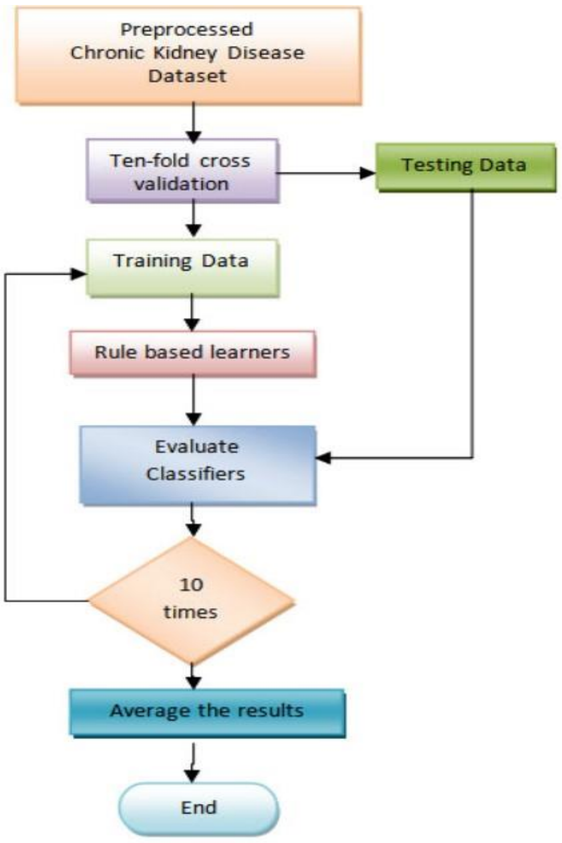


```
from sklearn.linear_model import LogisticRegression
lgr=LogisticRegression()
lgr.fit(x_train,y_train)
```

5 FLOW CHART:

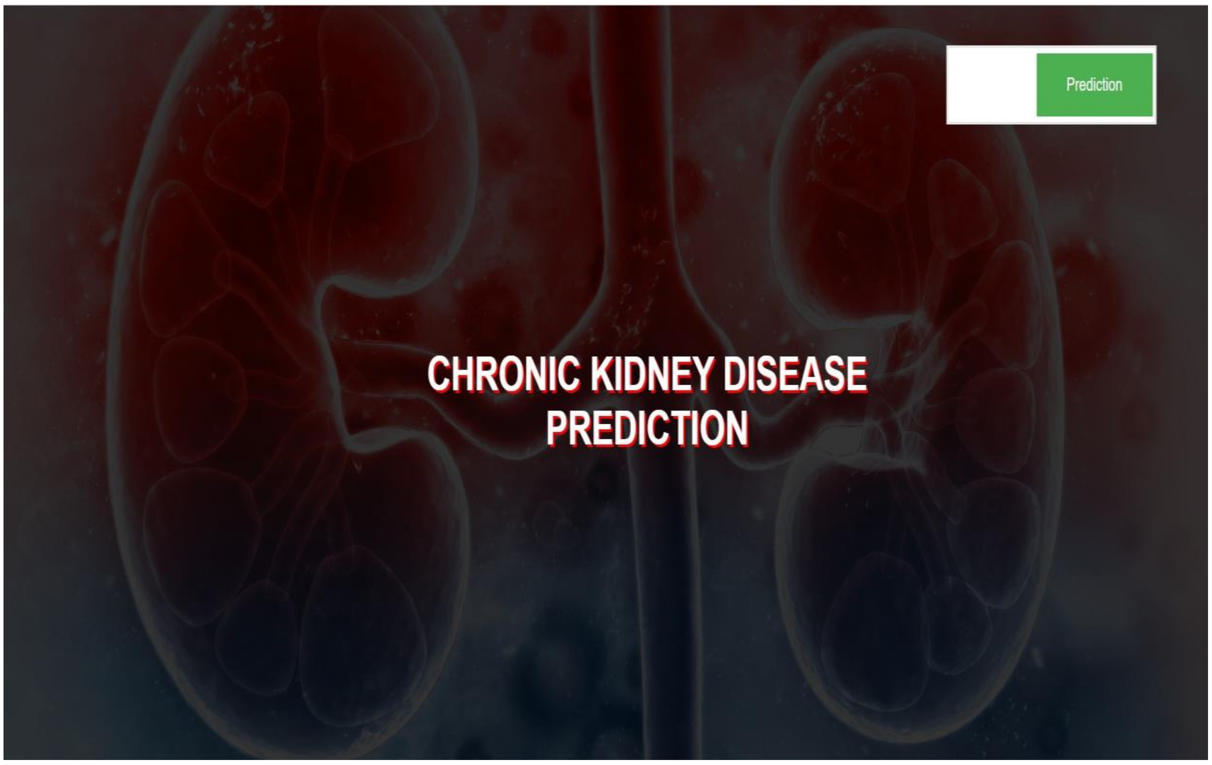
Following are the steps which are to be completed to complete this project

1. Download the dataset
2. Preprocess or clean the data
3. Analyze the pre-processed data
4. Train the machine with preprocessed data with an Appropriate Machine learning algorithm to build a model
5. save the model and its dependencies
6. Build a Web application using flask that integrates with Model built.

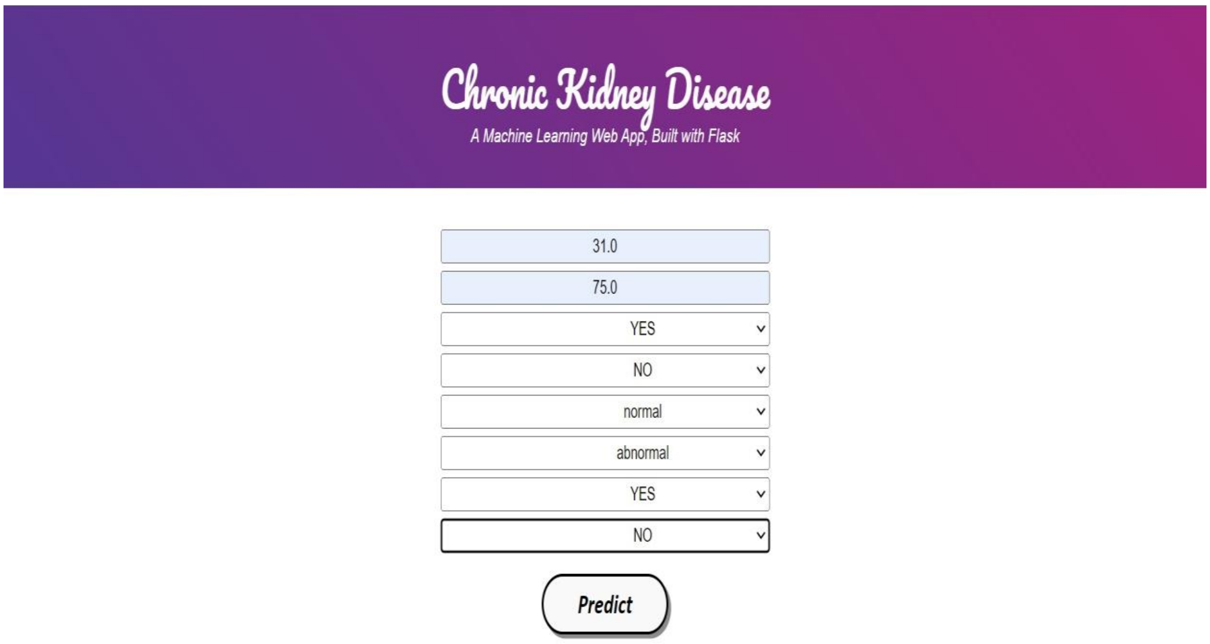


6 RESULT:

home.html



indexnew.html



Chronic Kidney Disease

A Machine Learning Web App, Built with Flask

31.0

75.0

YES

NO

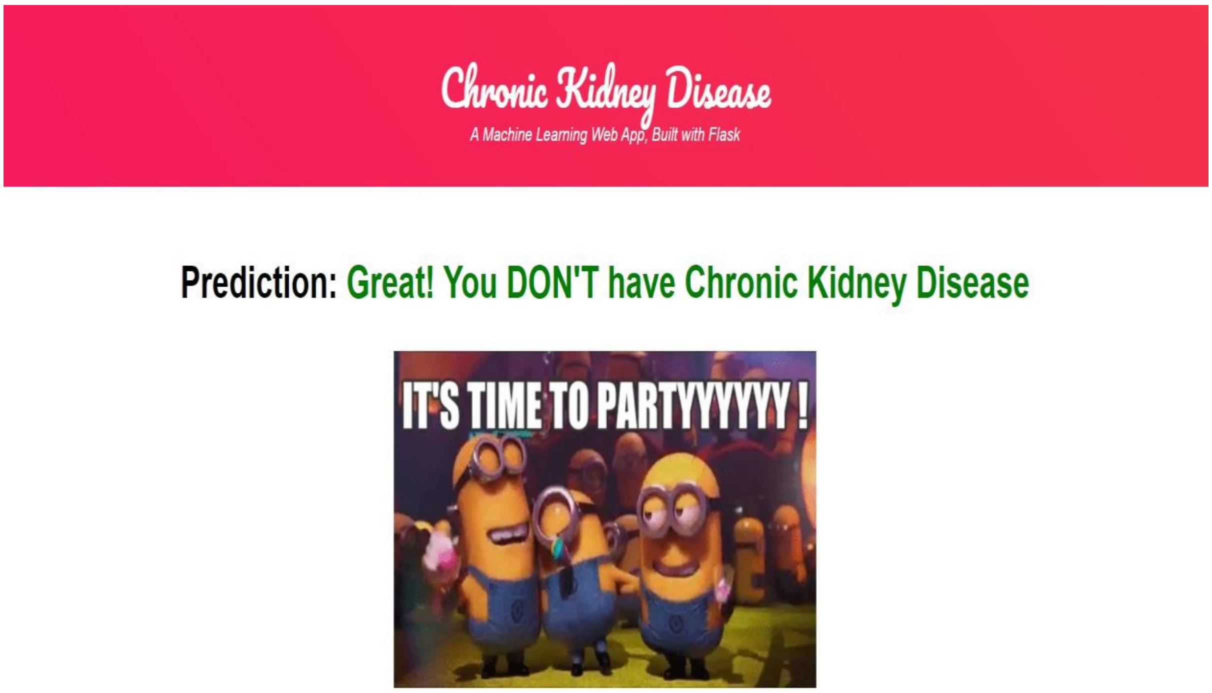
normal

abnormal

YES

NO

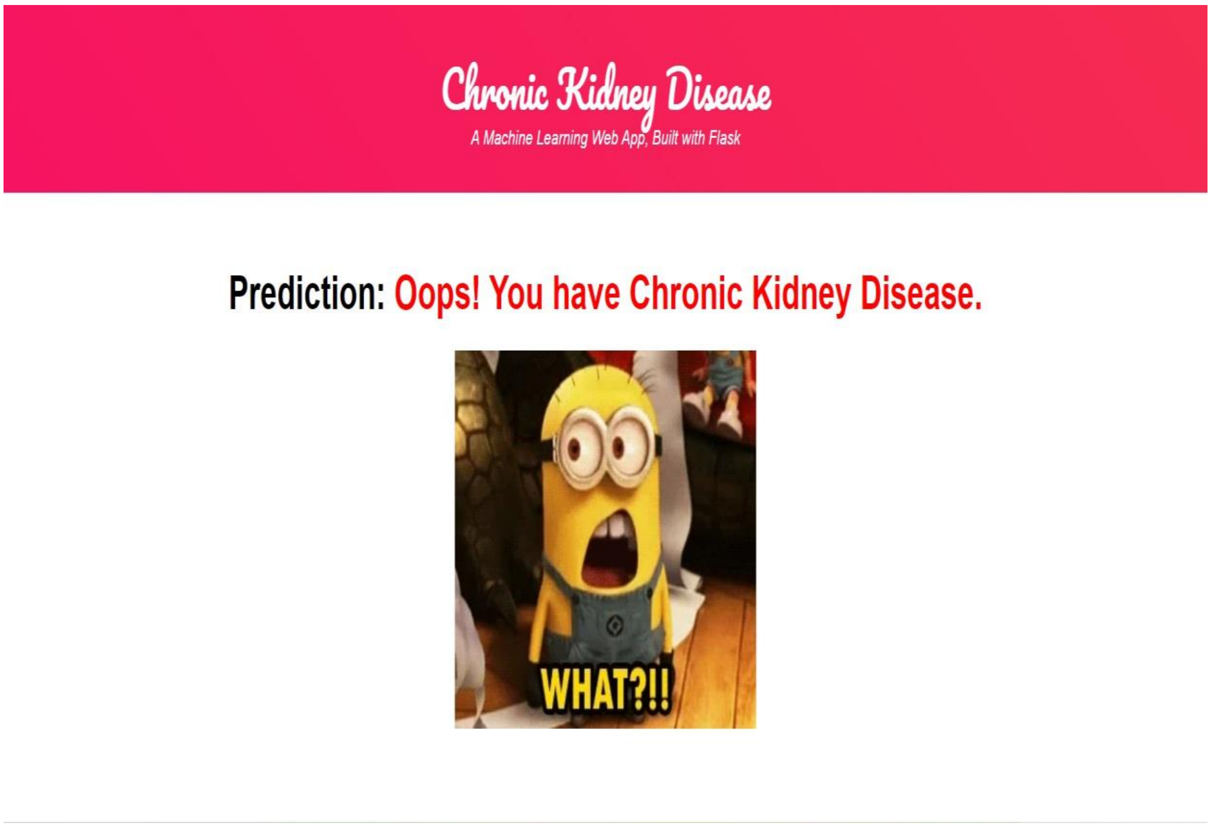
Result.html



Chronic Kidney Disease

A Machine Learning Web App, Built with Flask

Prediction: Great! You DON'T have Chronic Kidney Disease


Chronic Kidney Disease

A Machine Learning Web App, Built with Flask

Prediction: Oops! You have Chronic Kidney Disease.

7 ADVANTAGES:

- Easy to predict the result without the help of Doctor.
- Based on the test values we can get the result that whether we have chronic kidney disease or not.

DISADVATAGES:

- We cannot get the accurate results/prediction.
- Sometimes results may be wrong.

8 APPLICATIONS:

- This model is used to predict CKD status based on clinical data.
- Early prediction of kidney disease status is possible with this model.
- Really a useful model for predicting kidney diseases in present situation.

9 CONCLUSION:

- With the help of this model users can easily predict their disease quickly.
- The results will display whether the user have chronic kidney disease or not by taking some test values like blood urea, pus cell etc.

10 FUTURE SCOPE:

- Present world is running towards Machine Learning so,
- The future scope for this model is very high because by following some simple procedure only we are getting the disease prediction results.
- This model makes the user work easy by predicting the results quickly.

11 BIBILOGRAPHY:

- Flask Basics : https://www.youtube.com/watch?v=lj4I_CvBnt0
- Installation : https://youtu.be/5mDYijMfSzs
- Packages Installation : https://youtu.be/akj3_wTploU
- Supervised and Unsupervised Learning : https://youtu.be/kE5QZ8G_78c
- Regression classification and clustering : https://youtu.be/6za9_mh3uTE
- Logistic Regression : https://youtu.be/yIYKR4sgzI8