

1.INTRODUCTION

1.1. Overview:-

Chronic kidney disease is a global health burden with a high economic cost to health systems and is an independent risk factor for cardiovascular disease(CVD).All stages of CKD are associated with increased risks of cardiovascular morbidity, premature mortality and decreased quality of life.CKD is usually asymptomatic until later stages and accurate prevalence data are lacking.Thus we sought to determine the prevalence of CKD globally,by stage,geographical location,gender and age.

1.2. Purpose:-

The aim of the present study was to systematically review published economic models that simulated long term outcomes of kidney disease to inform cost-effectiveness evaluation of CKD treatments.Chronic kidney disease is a major medical problem and can be cured if treated it in the early stages.Usually people are not aware that medical tests ,taking different purposes could contain valuable information concerning kidney disease.

2.LITERATURE SURVEY

2.1. Existing Problem:-

The kidneys are highly vascularized, meaning they contain lots of blood vessels.So blood vessel disease are generally dangerous to kidneys.The two main causes of CKD are diabetes and high blood pressure which are responsible for up to two-thirds of the cases.Progressive CKD is linked to several complications with higher prevalence and intensity at lower levels

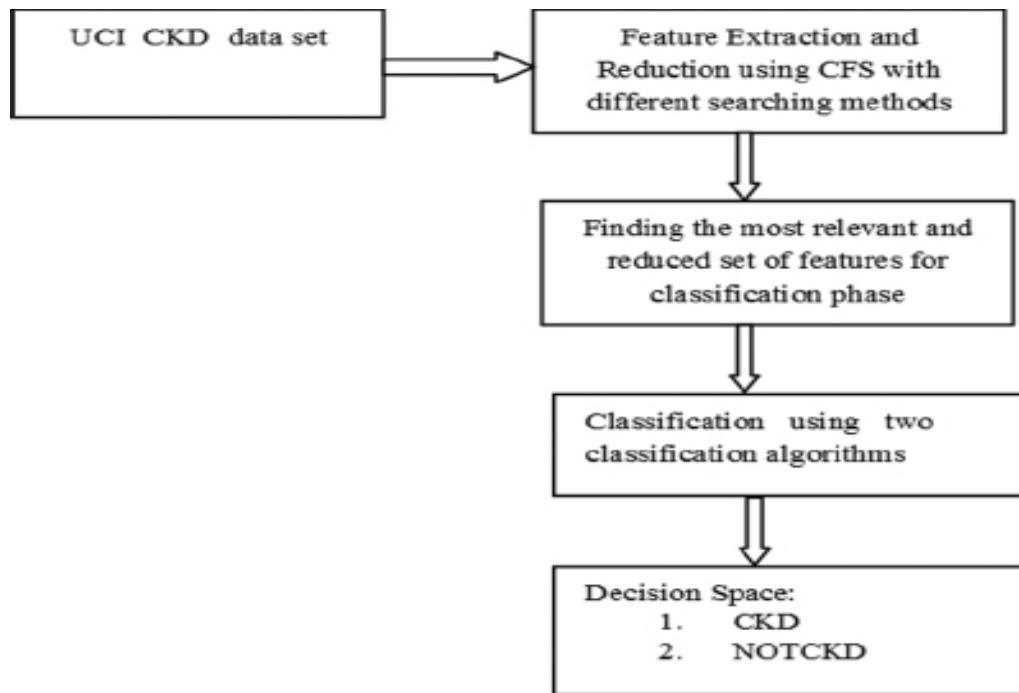
of kidney function. Some of these complications can be readily defined and quantified as cardiovascular disease, hypertension, anemia, mineral bone disorder, volume overload, electrolytes and acid-base abnormalities etc. 37 million people in the United States are living with chronic kidney disease. The burden of CKD in India can not be assessed accurately. The approximate prevalence of CKD is 800 per million population (pmp), and the incidence of end-stage renal disease (ESRD) is 150-200 pmp.

2.2. Proposed Solution:-

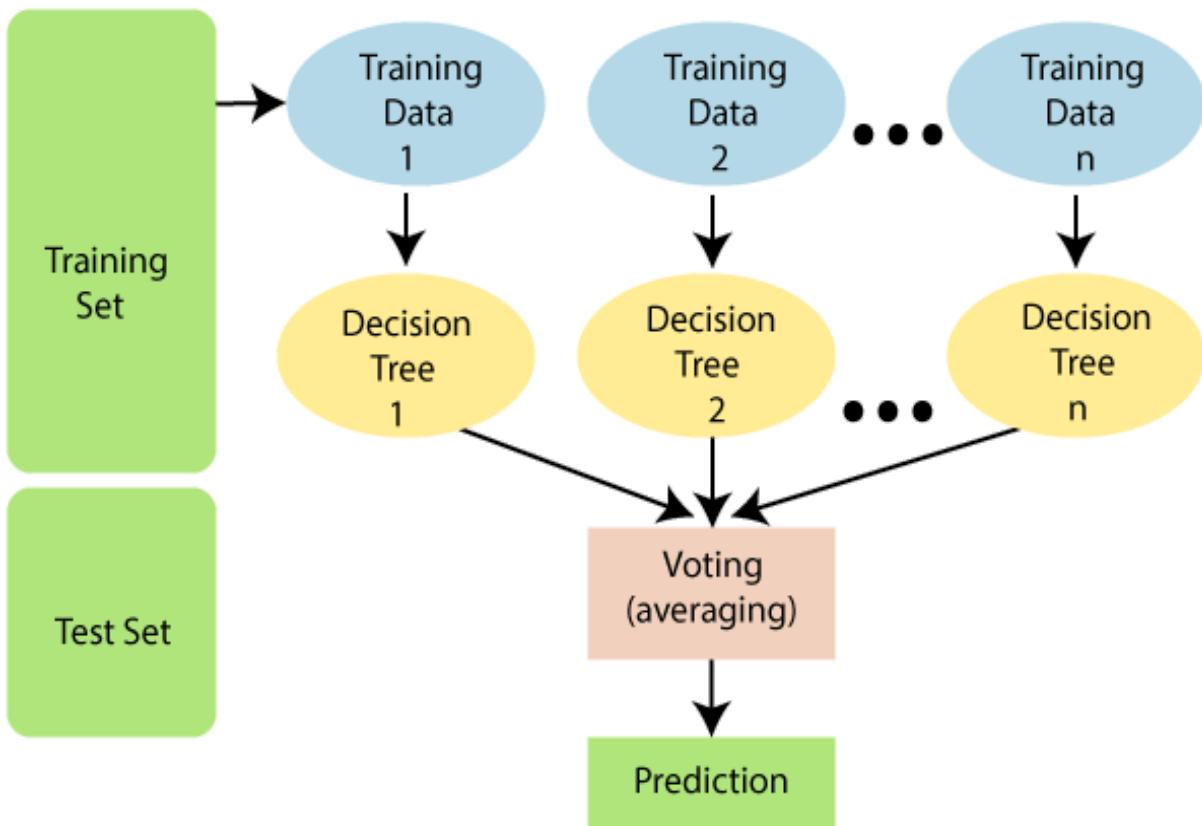
For the treatment of any disease, availability of therapy and its affordability are two important issues. If a person have diabetes or high blood pressure, working with the doctor to keep blood sugar and blood pressure under control is the best way to prevent kidney disease. Follow a low-salt, low-fat diet, Exercise atleast 30 minutes on most days of the week, Have regular check the sugar and pressure in the blood. Angiotensin-converting enzyme inhibitors (ACEis) or angiotensin-receptor blockers (ARBs) comprise the standard of care for treatment of diabetic nephropathy as well as many other forms of CKD. If the kidneys can't keep up with waste and fluid clearance on their own then the person develop complete or near-complete kidney failure and have end stage kidney disease. At that point dialysis or kidney transplant is needed. Regenerative medicine approaches may be developed in the future to help slow progression of the disease.

3. THEORITICAL ANALYSIS

3.1. Block diagram:-



3.2.Hardware/Software designing:-



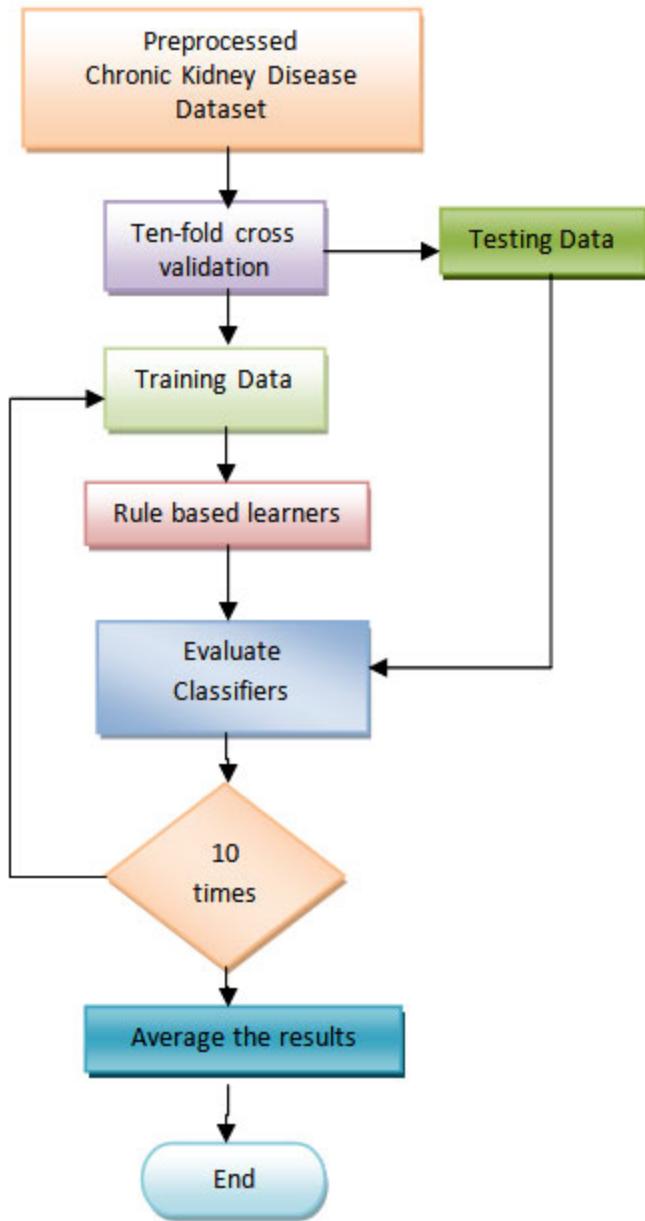


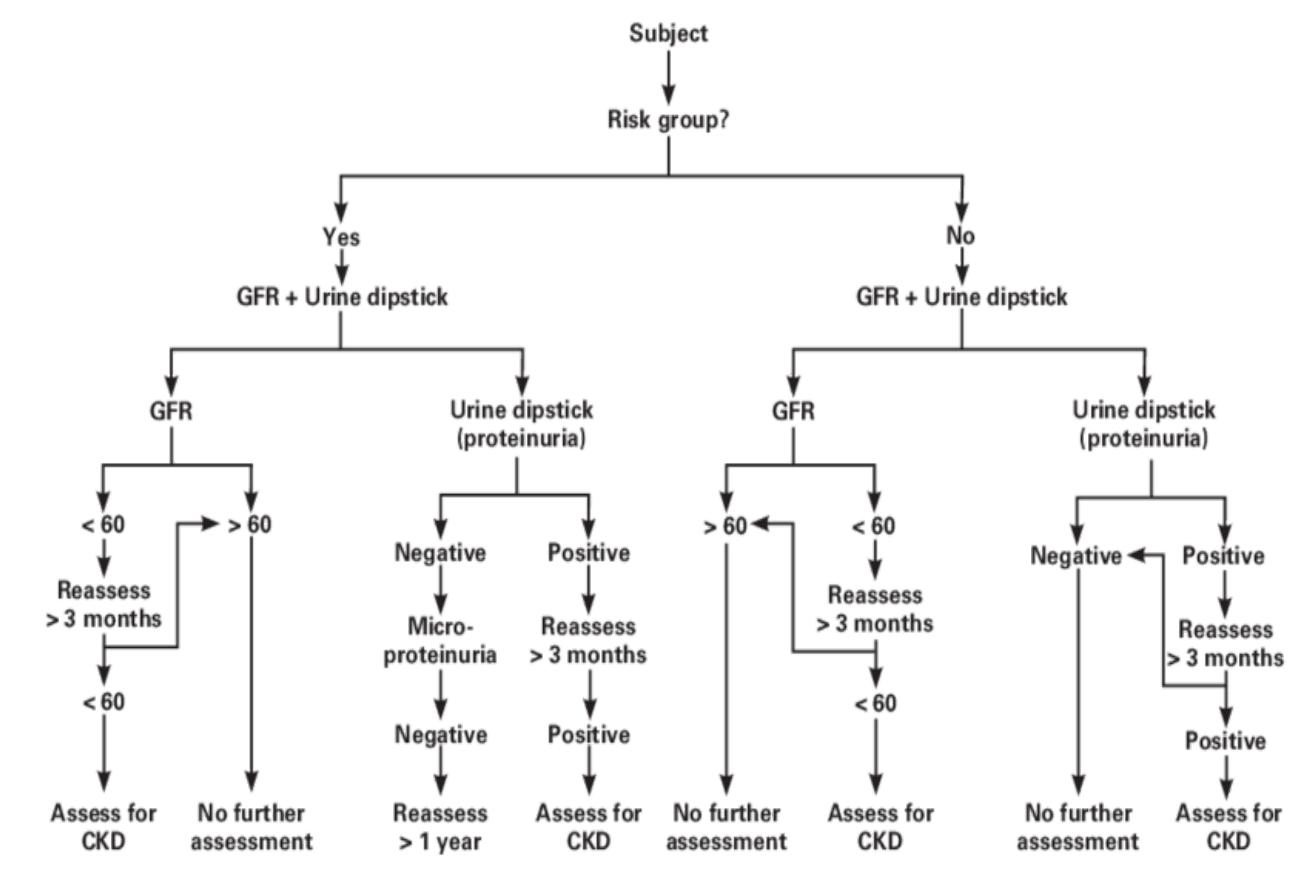
Figure 2: Workflow of the CKD prediction.

4.EXPERIMENTAL INVESTIGATIONS

Chronic kidney disease of uncertain etiology describes a disorder in which CKD is not due to disorders such as diabetes, hypertension, glomerulonephritis, or HIV infections. CKDu is found in tropical countries and is more common in young men in agricultural communities working in

high ambient temperatures and with exposure to agrochemicals. In rural areas, drinking unsafe water, exposed to pesticides, and more likely to use herbal remedies and have a family history of CKD compared with controls.

5.FLOWCHART



6.RESULT

The prevalence of CKD has risen between the periods 1988-1994 and 1998-2004. There are numerous limitations to the estimated glomerular filtration fraction (eGFR) measure of renal function. Albuminuria, which impacts cardiovascular risk as well as CKD progression, should be combined with eGFR. Recommendation for primary, secondary and tertiary prevention of CKD as well as appropriate referrals to a nephrologist were

provided.

7.ADVANTAGES

The worldwide rise in the number of patients with CKD is reflected in the increasing number of people with ESRD treated by renal replacement therapy-dialysis or transplantation.In the UK, the annual incidence of ESRD has doubled over the past decade to reach about 100 new patients per million of population.About 90% of treated ESRD patients come from more developed countries that can still afford the cost of renal replacement therapy.There is a clear and direct relation between the gross national product and the availability of renal replacement therapy,with less developed countries unable to meet the increasing demand.

DISADVANTAGES

CKD is a major factor for cardiovascular disease.Patients with CKD stages 1-4 should be considered in the highest risk category for cardiovascular disease risk reduction strategies.These include treatment of hyperglycemia in patients with diabetes,physical activity,smoking cessation, and use of antiplatelet and lipid lowering drugs in appropriate patients.The flse negative rate can not be known the infinite number of ways that a provider could refer to CKD in an electronic note.

8.APPLICATIONS

Reported features of the 9 studies testing a developed app varied widely. 8 allowed patients to track their food intake like a food diary,7 had a calorie-counting function,7 provided dietary recommendations regarding minerals,6 provided dietary recommendations regarding protien, and 6 provided personalized DRIs.No apps contained a feature that recommended CKD-friendly recipes.

9.CONCLUSION

A good approach for identifying CKD is to screen people, Current recommendations suggest screening of individuals with structural disease of the renal tract, hypertension, CVD, diabetes, family history of kidney disease and auto immune disease with potential for kidney involvement during routine primary health encounters. In the stream of health science not much work has been carried out concerning CKD. Still there is always hope for better results and there are a number of ways to detect CKD.

10.FUTURE SCOPE

The concept of classifying CKD based on eGFR has greatly improved our understanding of the epidemiology of CKD. The focus is now shifting towards risk stratification and identification of the individuals at the highest risk of progression that may benefit from early referral and evaluation. Another challenge is to recognise the full range of preventable complications of CKD. The early focus was on cardiovascular disease and mortality as the most common cause of death and kidney failure as the end stage kidney outcome. However, a wide spectrum acute kidney injury is likely more common in the presence of underlying CKD, as are suboptimal medical care, including inappropriate medication dosing and non kidney outcomes such as infection and pneumonia.

11.BIBLIOGRAPHY

1. Charytan D, Kuntz RE. The exclusion of patients with chronic kidney disease from clinical trials in coronary artery disease. *Kidney Int* 2006;70:2021-2030.
2. Eckardt KU, Coresh J, Devuyst O, Johnson RJ, Kottgen A, Levey AS, Levin A. Evolving importance of kidney disease: from subspecialty to global health burden. *Lancet* 2013;382:158-169.
3. National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: Evaluation, classification, and stratification. *Am J Kidney Dis*. 2002;39:S1-S266.
4. Centers for Disease Control and Prevention. Prevalence of chronic kidney

disease and associated risk factors—United States, 1999–2004. *Morb Mortal Wkly Rep*. 2007;56:161–165.

Order of people speaking in Project Demonstration Video:

Dipti Agrawal

Sumitra Singh

Harsha Vardhan

Rayudu Sushma

APPLICATION

The term "chronic kidney disease" means lasting damage to the kidneys that can get worse over time. If the damage is very bad, your kidneys may stop working. This is called kidney failure, or end-stage renal disease (ESRD). If your kidneys fail, you will need dialysis or a kidney transplant in order to live. Anyone can get CKD. Some people are more at risk than others. Chronic kidney disease includes conditions that damage your kidneys and decrease their ability to keep you healthy by doing the jobs listed. If kidney disease gets worse, wastes can build to high levels in your blood and make you feel sick. You may develop complications like high blood pressure, anemia (low blood count), weak bones, poor nutritional health and nerve damage. Also, kidney disease increases your risk of having heart and blood vessel disease. These problems may happen slowly over a long period of time. Chronic kidney disease may be caused by diabetes, high blood pressure and other disorders. Early detection and treatment can often keep chronic kidney disease from getting worse. When kidney disease progresses, it may eventually lead to kidney failure, which requires dialysis or a kidney transplant to maintain life.

Cause:
Some things that increase your risk for CKD include:

- Diabetes
- High blood pressure (hypertension)
- Heart disease
- Having a family member with kidney disease
- Being over 60 years old

Symptoms
You may notice one or more of the following symptoms if your kidneys are beginning to fail:

- Itching
- Muscle cramps
- Nausea and vomiting
- Not feeling hungry
- Swelling in your feet and ankles
- Too much urine (pee) or not enough urine
- Trouble catching your breath
- Trouble sleeping

Predictor

red blood cells

Age
Albumin
Serum Creatinine
Sodium
Potassium
haemoglobin
Packed Cell Volume
White Blood Cells Count

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- Trouble sleeping

Prevention

Diabetes and high blood pressure are the most common causes of CKD. If you have diabetes or high blood pressure, working with your doctor to keep your blood sugar and blood pressure under control is the best way to prevent kidney disease. Living a healthy lifestyle can help prevent diabetes, high blood pressure and kidney disease, or help keep them under control. Follow these tips to lower your risk for kidney disease and the problems that cause it:

- Follow a low-salt, low-fat diet
- Exercise at least 30 minutes on most days of the week
- Have regular check-ups with your doctor
- Do not smoke or use tobacco
- Limit alcohol

Treatment

Damage to your kidneys is usually permanent. Although the damage cannot be fixed, you can take steps to keep your kidneys as healthy as possible for as long as possible.

Predictor

red blood cells

Age

Albumin

Serum Creatinine

Sodium

Potassium

haemoglobin

Packed Cell Volume

White Blood Cells Count

Red Blood Cells Count

hypertension

diabetes

anemia

Predict

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UI OUTPUT

CHRONIC KIDNEY DISEASE ANALYSIS

The term "chronic kidney disease" means lasting damage to the kidneys that can get worse over time. If the damage is very bad, your kidneys may stop working. This is called kidney failure, or end-stage renal disease (ESRD). If your kidneys fail, you will need dialysis or a kidney transplant in order to live. Anyone can get CKD. Some people are more at risk than others. Chronic kidney disease includes conditions that damage your kidneys and decrease their ability to keep you healthy by doing the jobs listed. If kidney disease gets worse, wastes can build to high levels in your blood and make you feel sick. You may develop complications like high blood pressure, anemia (low blood count), weak bones, poor nutritional health and nerve damage. Also, kidney disease increases your risk of having heart and blood vessel disease. These problems may happen slowly over a long period of time. Chronic kidney disease may be caused by diabetes, high blood pressure and other disorders. Early detection and treatment can often keep chronic kidney disease from getting worse. When kidney disease progresses, it may eventually lead to kidney failure, which requires dialysis or a kidney transplant to maintain life.

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Predictor

red blood cells

Age

Albumin

Serum Creatinine

Sodium

Potassium

Prediction: Chronic Kidney Disease

Task and Progress Snippets

DATA COLLECTION and IMPORTING LIBRARIES AND DATAFILE

The screenshot shows a Jupyter Notebook interface with the title "Chronic Kidney Disease Analysis". The notebook has three cells:

- Importing Libraries:**

```
In [1]: import numpy as np  
import pandas as pd  
import matplotlib.pyplot as plt
```
- Getting Dataset:**

Source : <https://www.kaggle.com/mansoordaku/ckdisease>

```
In [2]: data=pd.read_csv("chronic_dataset.csv")  
data
```

Out[2]:

	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	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
...	
395	395	55.0	80.0	1.020	0.0	0.0	normal	normal	notpresent	notpresent	...	47	6700	4.9	no	no	no	good	no	no	notckd
396	396	42.0	70.0	1.025	0.0	0.0	normal	normal	notpresent	notpresent	...	54	7800	6.2	no	no	no	good	no	no	notckd
397	397	12.0	80.0	1.020	0.0	0.0	normal	normal	notpresent	notpresent	...	49	6600	5.4	no	no	no	good	no	no	notckd
398	398	17.0	80.0	1.025	0.0	0.0	normal	normal	notpresent	notpresent	...	41	7200	5.9	no	no	no	good	no	no	notckd

TAKING CARE OF MISSING DATA

Jupyter Chronic Kidney Disease Analysis Last Checkpoint 5 hours ago (autosaved)

```
In [11]: data[data["age"].isnull()].index.tolist()
Out[11]: [30, 73, 112, 116, 117, 169, 191, 203, 268]

In [12]: data["age"].fillna(data["age"].mean(), inplace=True)

In [13]: data["age"] = data["age"].round()

In [14]: data[data["al"].isnull()].index.tolist()
        ... 

In [15]: data["al"].mode()
Out[15]: 0    0.0
dtype: float64

In [16]: data["al"].fillna(data["al"].mode().iloc[0], inplace=True)

In [17]: data[data["rbc"].isnull()].index.tolist()
        ... 

In [18]: data["rbc"].mode()
Out[18]: 0    normal
dtype: object

In [19]: data["rbc"].fillna(data["rbc"].mode().iloc[0], inplace=True)

In [20]: data["rbc"][0]
Out[20]: 'normal'
```

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```
Out[20]: 'normal'

In [21]: data[data["sc"].isnull()].index.tolist()
        ... 

In [22]: data["sc"].fillna(data["sc"].mean(), inplace=True)

In [23]: data[data["hemo"].isnull()].index.tolist()
        ... 

In [24]: data["hemo"].fillna(data["hemo"].mean(), inplace=True)

In [25]: data[data["pcv"].isnull()].index.tolist()
        ... 

In [26]: data["pcv"].fillna(data["pcv"].mean(), inplace=True)

In [27]: data[data["sod"].isnull()].index.tolist()
        ... 

In [28]: data["sod"].fillna(data["sod"].mean(), inplace=True)

In [29]: data[data["pot"].isnull()].index.tolist()
        ... 

In [30]: data["pot"].fillna(data["pot"].mean(), inplace=True)

In [31]: data[data["wc"].isnull()].index.tolist()
```

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In [32]: `data["wc"].fillna(data["wc"].mean(), inplace=True)`

Out[33]: 8406.122448979591

In [34]: `data["wc"].mean()`

Out[34]: 8406.122448979597

In [35]: `data[data["rc"].isnull()].index.tolist()`

In [36]: `data["rc"].fillna(data["rc"].mean(), inplace=True)`

In [37]: `data[data["htn"].isnull()].index.tolist()`

Out[37]: [288, 297]

In [38]: `data["htn"].mode()`

Out[38]: 0 no
dtype: object

In [39]: `data["htn"].fillna(data["htn"].mode().iloc[0], inplace=True)`

In [40]: `data[data["dm"].isnull()].index.tolist()`

Out[40]: [288, 297]

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In [42]: `data["dm"].mode()`

Out[42]: 0 no
dtype: object

In [43]: `data[data["ane"].isnull()].index.tolist()`

Out[43]: [294]

In [44]: `data["ane"].fillna(data["ane"].mode().iloc[0], inplace=True)`

In [45]: `data.isnull().any()`

Out[45]:

	age	al	rbc	sc	sod	pot	hemo	pcv	wc	rc	htn	dm	ane	classification
age	False													
al	False													
rbc	False													
sc	False													
sod	False													
pot	False													
hemo	False													
pcv	False													
wc	False													
rc	False													
htn	False													
dm	False													
ane	False													
classification	False													

In [46]: `data`

Out[46]:

	age	al	rbc	sc	sod	pot	hemo	pcv	wc	rc	htn	dm	ane	classification
age	8406.122448979591	0	0	0	0	0	0	0	0	0	0	0	0	0
al	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rbc	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sc	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sod	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pot	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hemo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pcv	0	0	0	0	0	0	0	0	0	0	0	0	0	0
wc	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rc	0	0	0	0	0	0	0	0	0	0	0	0	0	0
htn	0	0	0	0	0	0	0	0	0	0	0	0	0	0
dm	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ane	0	0	0	0	0	0	0	0	0	0	0	0	0	0
classification	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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In [46]: data

```
Out[46]:
      age   al   rbc   sc   sod   po   hemo   pcv   wc   r   htn   dm   ane   classification
0  48.0  1.0  normal  1.2  137.528754  4.627244  15.4  44.0  7800.0  5.200000  yes  yes  no   ckd
1  7.0   4.0  normal  0.8  137.528754  4.627244  11.3  38.0  6000.0  4.707435  no   no  no   ckd
2  62.0  2.0  normal  1.8  137.528754  4.627244  9.6   31.0  7500.0  4.707435  no   yes  yes  ckd
3  48.0  4.0  normal  3.8  111.000000  2.500000  11.2  32.0  6700.0  3.900000  yes  no   yes  ckd
4  51.0  2.0  normal  1.4  137.528754  4.627244  11.6  35.0  7300.0  4.600000  no   no  no   ckd
...
395 55.0  0.0  normal  0.5  150.000000  4.900000  15.7  47.0  6700.0  4.900000  no   no  no   notckd
396 42.0  0.0  normal  1.2  141.000000  3.500000  16.5  54.0  7800.0  6.200000  no   no  no   notckd
397 12.0  0.0  normal  0.6  137.000000  4.400000  15.8  49.0  6600.0  5.400000  no   no  no   notckd
398 17.0  0.0  normal  1.0  135.000000  4.900000  14.2  51.0  7200.0  5.900000  no   no  no   notckd
399 58.0  0.0  normal  1.1  141.000000  3.500000  15.8  53.0  6800.0  6.100000  no   no  no   notckd
```

400 rows × 14 columns

Checking Outliers

In [47]: `import seaborn as sns
sns.boxplot(x=data['age'])`

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LABEL ENCODING AND ONEHOTENCODING

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In [47]: `[17.0, 0.0, 'normal', ..., 'no', 'no', 'no'], dtype=object)`

In [57]: `y = data_outlier.iloc[:, -1].values`

One Hot Encoding

In [58]: `from sklearn.preprocessing import OneHotEncoder
from sklearn.compose import ColumnTransformer`

In [59]: `ct = ColumnTransformer([("oh", OneHotEncoder(), [2])], remainder="passthrough")
x = ct.fit_transform(x)`

In [60]: `x = x[:, 1:]
x`

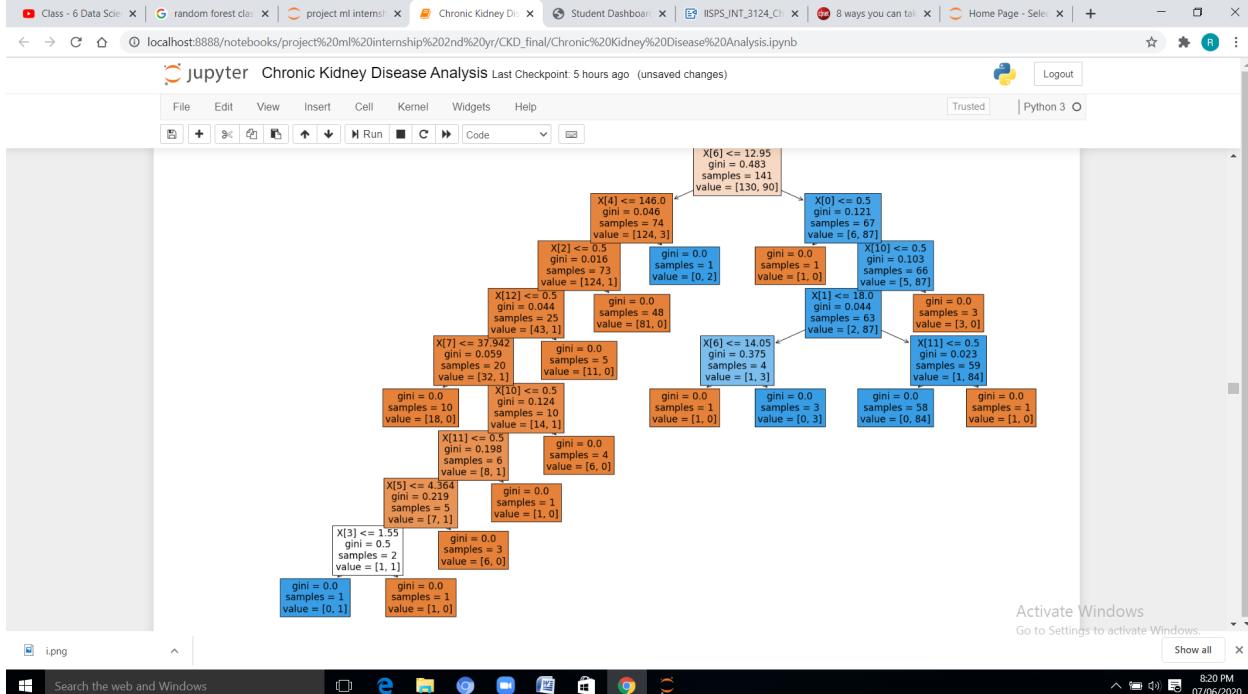
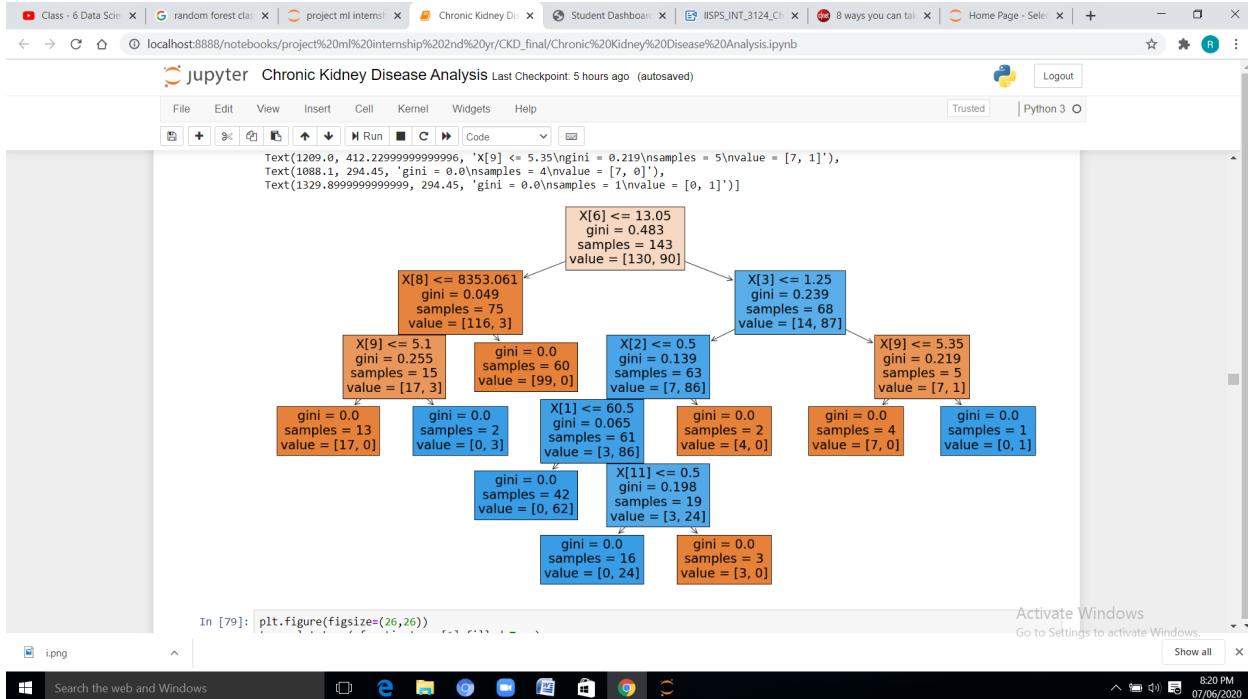
```
Out[60]: array([[1.0, 48.0, 1.0, ..., 'yes', 'yes', 'no'],
 [1.0, 62.0, 2.0, ..., 'no', 'yes', 'yes'],
 [1.0, 51.0, 2.0, ..., 'no', 'no', 'no'],
 ...,
 [1.0, 55.0, 0.0, ..., 'no', 'no', 'no'],
 [1.0, 12.0, 0.0, ..., 'no', 'no', 'no'],
 [1.0, 17.0, 0.0, ..., 'no', 'no', 'no']], dtype=object)
```

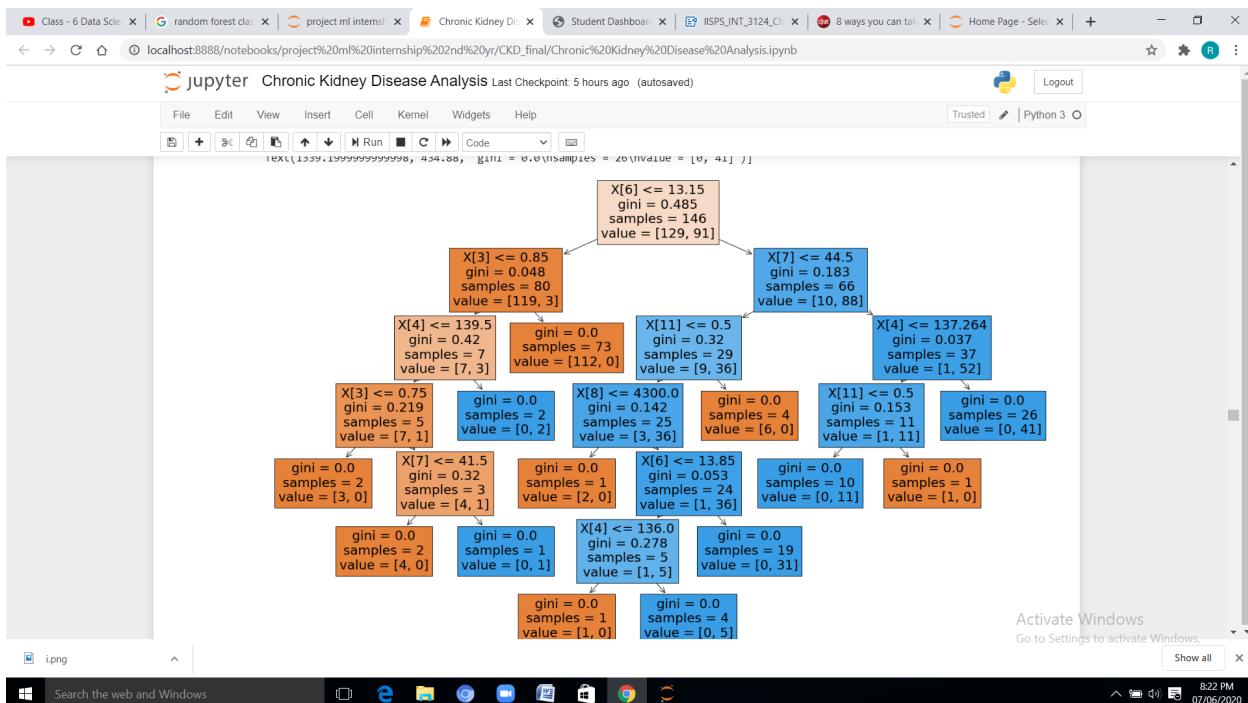
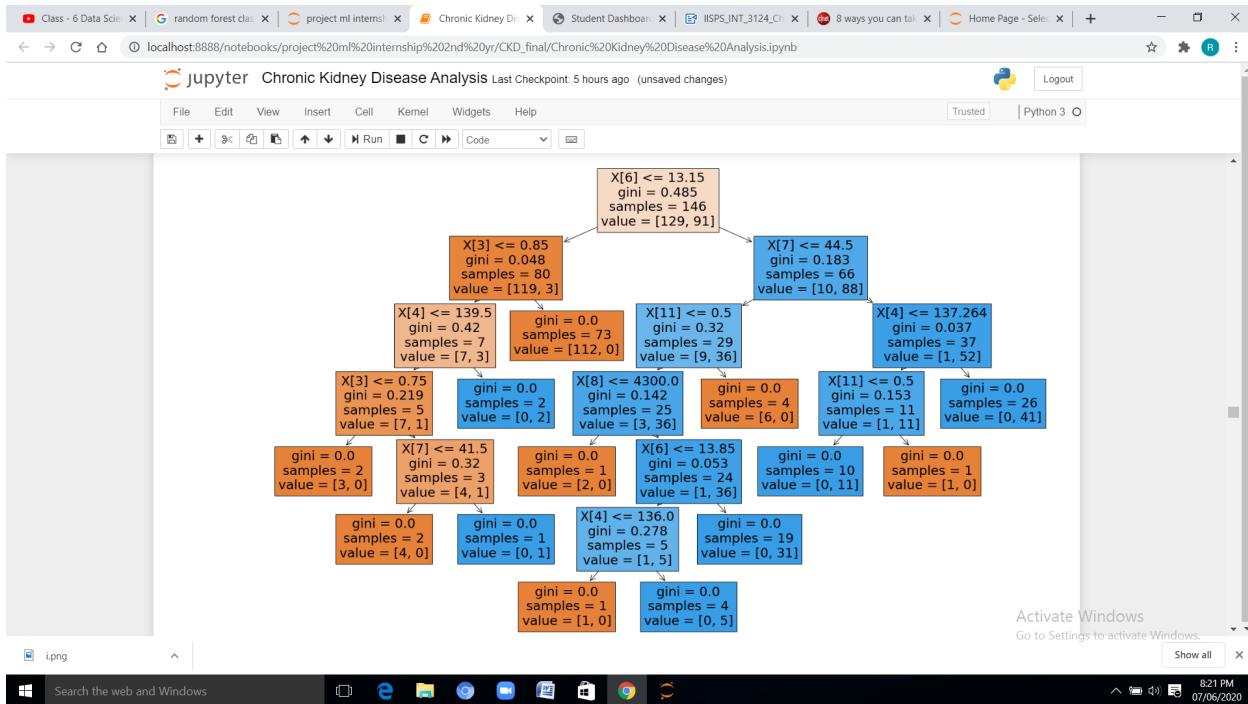
Label Encoder

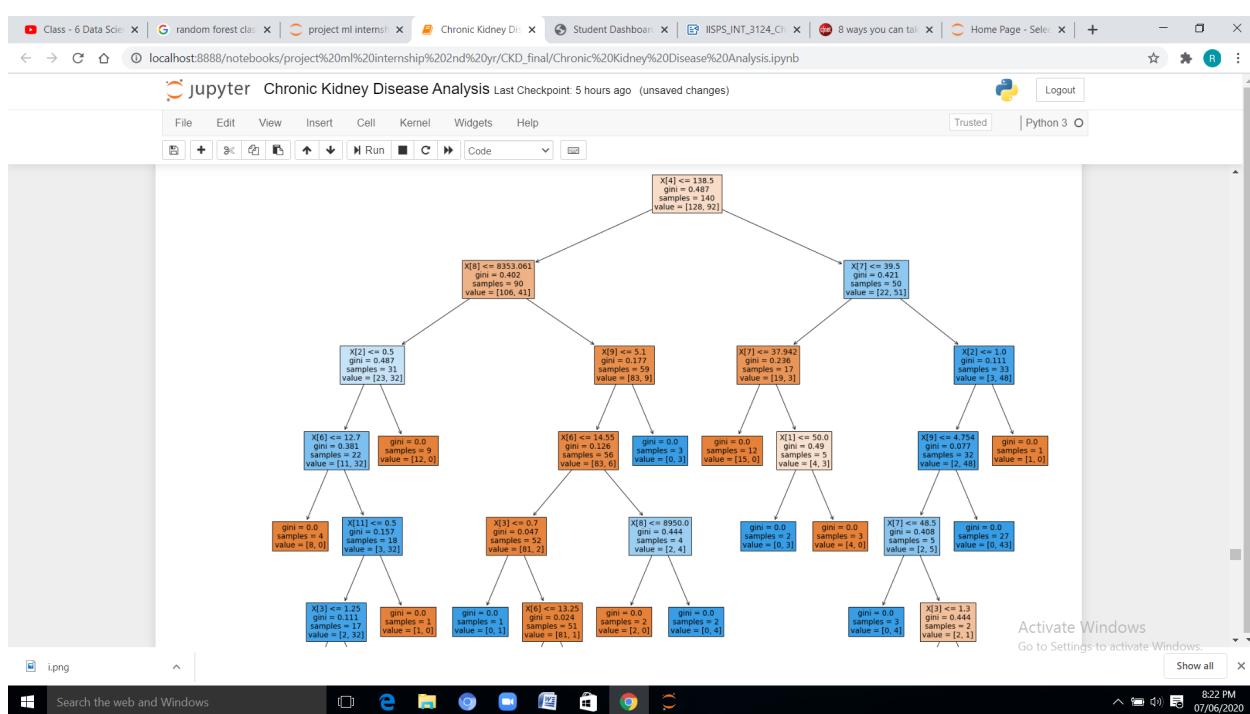
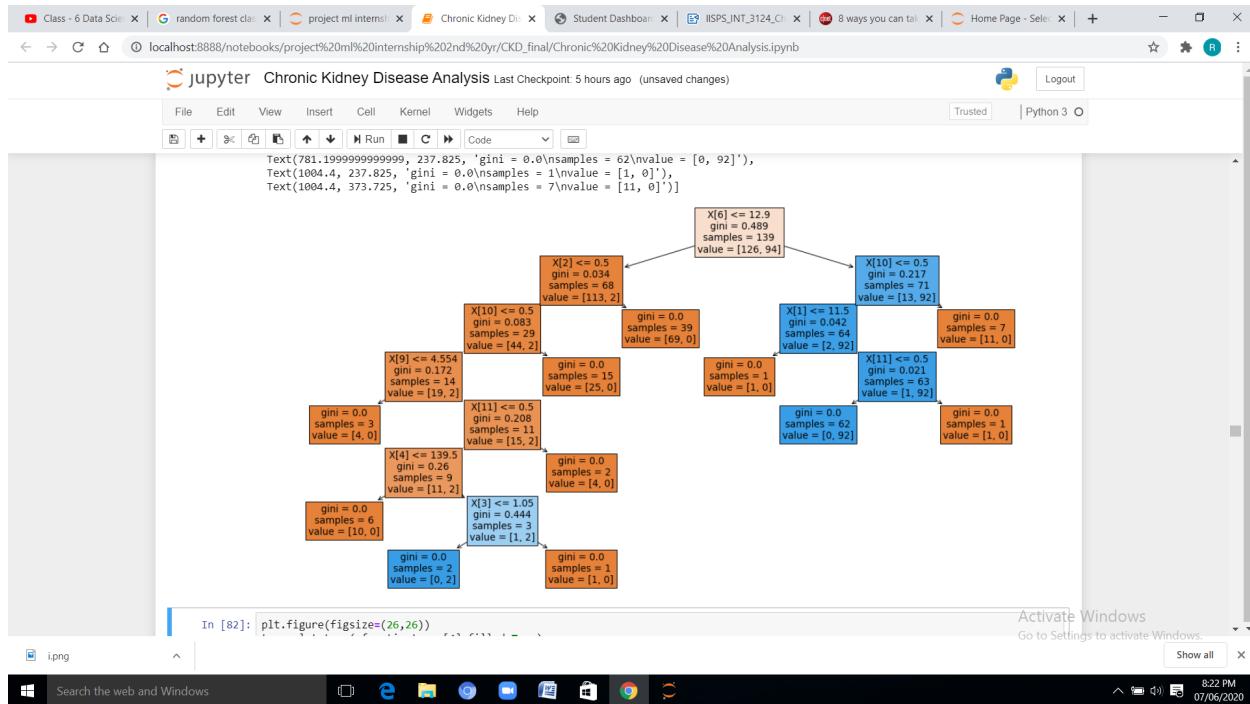
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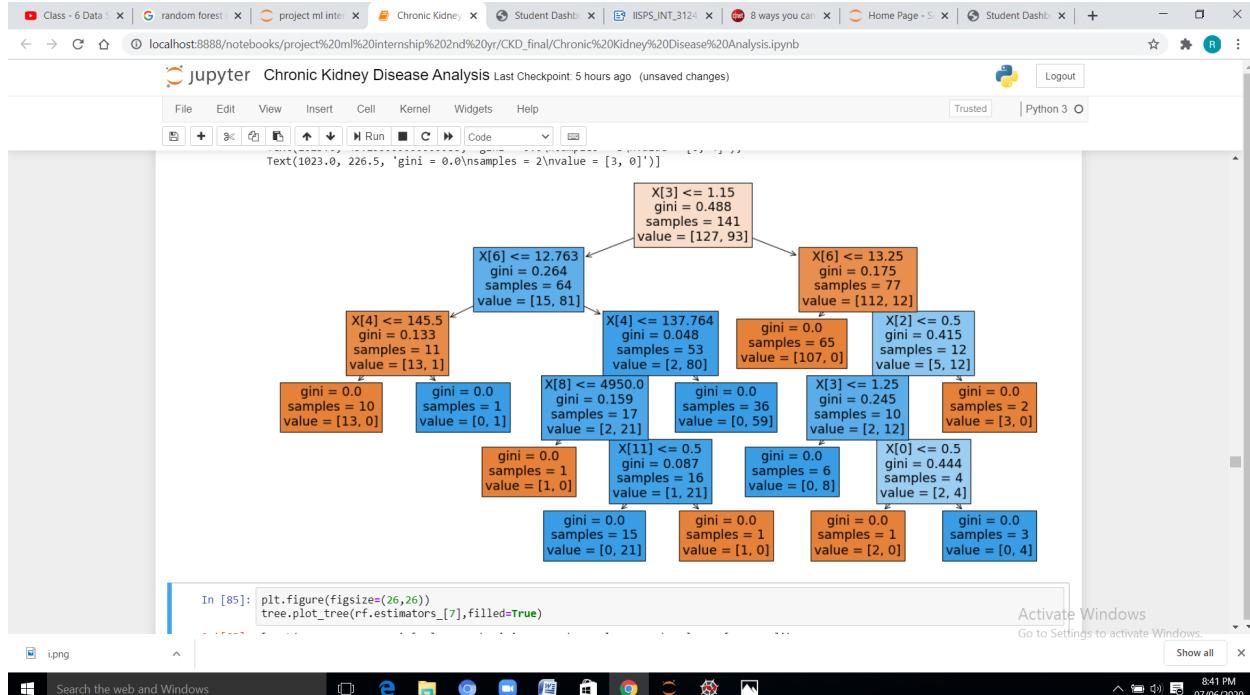
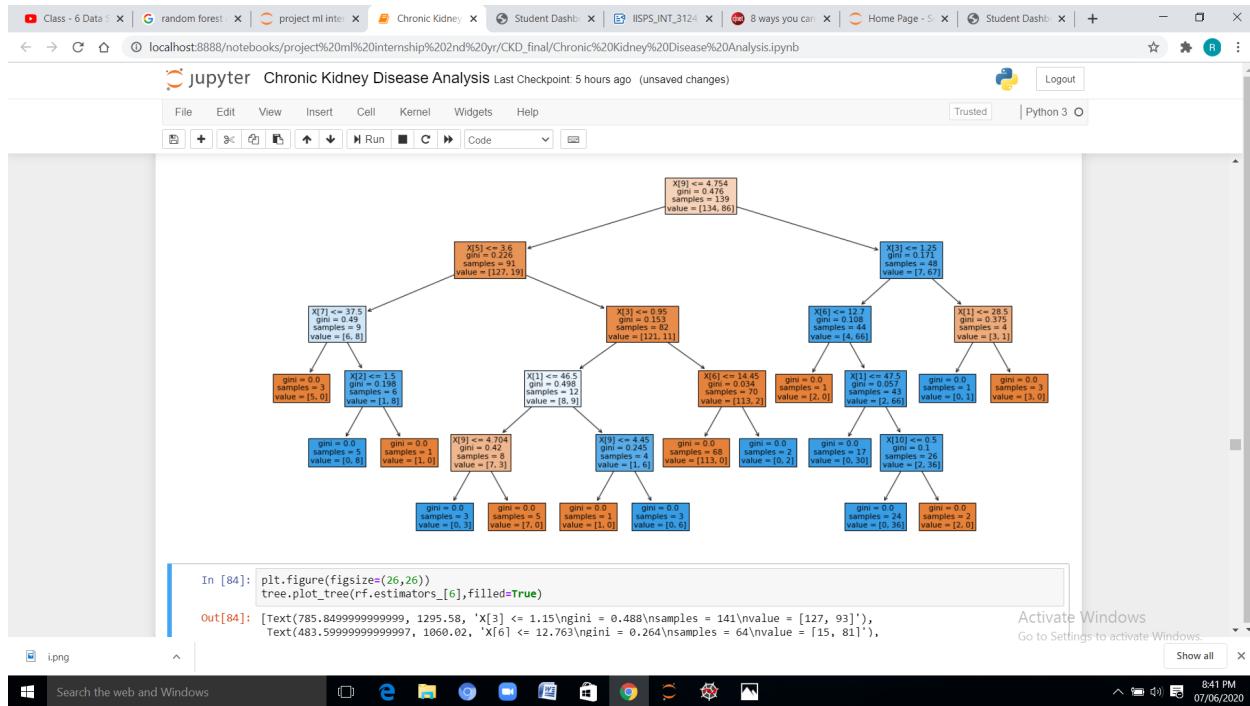
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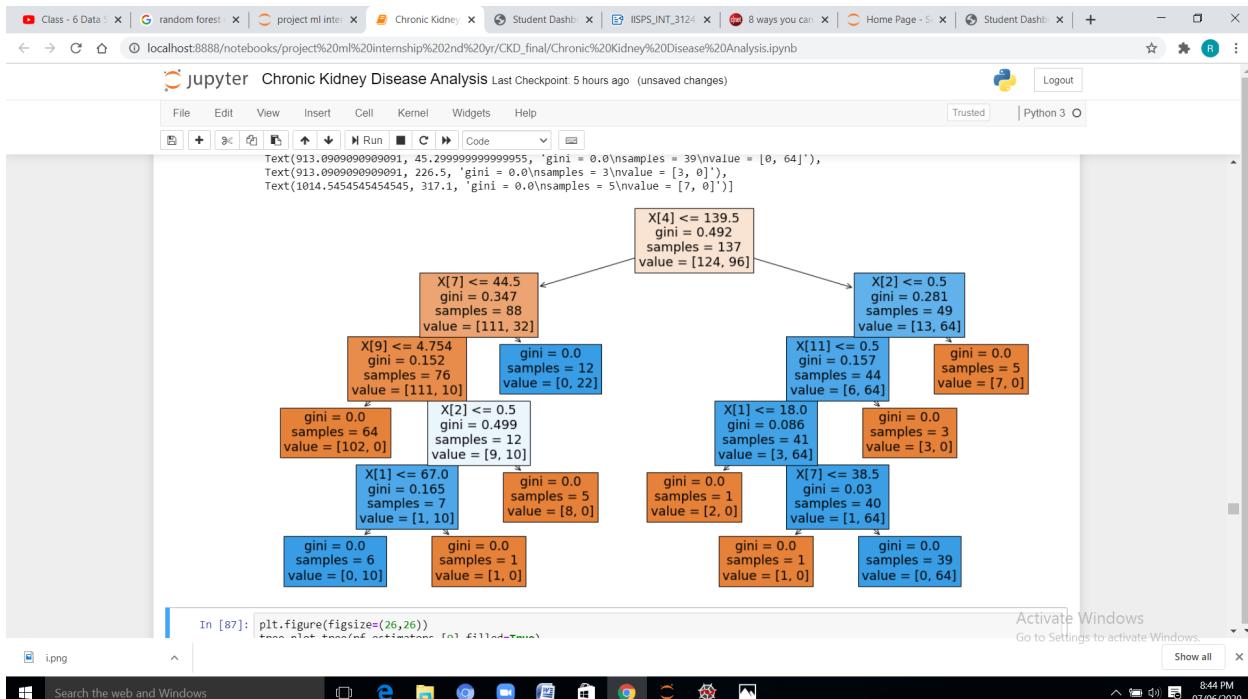
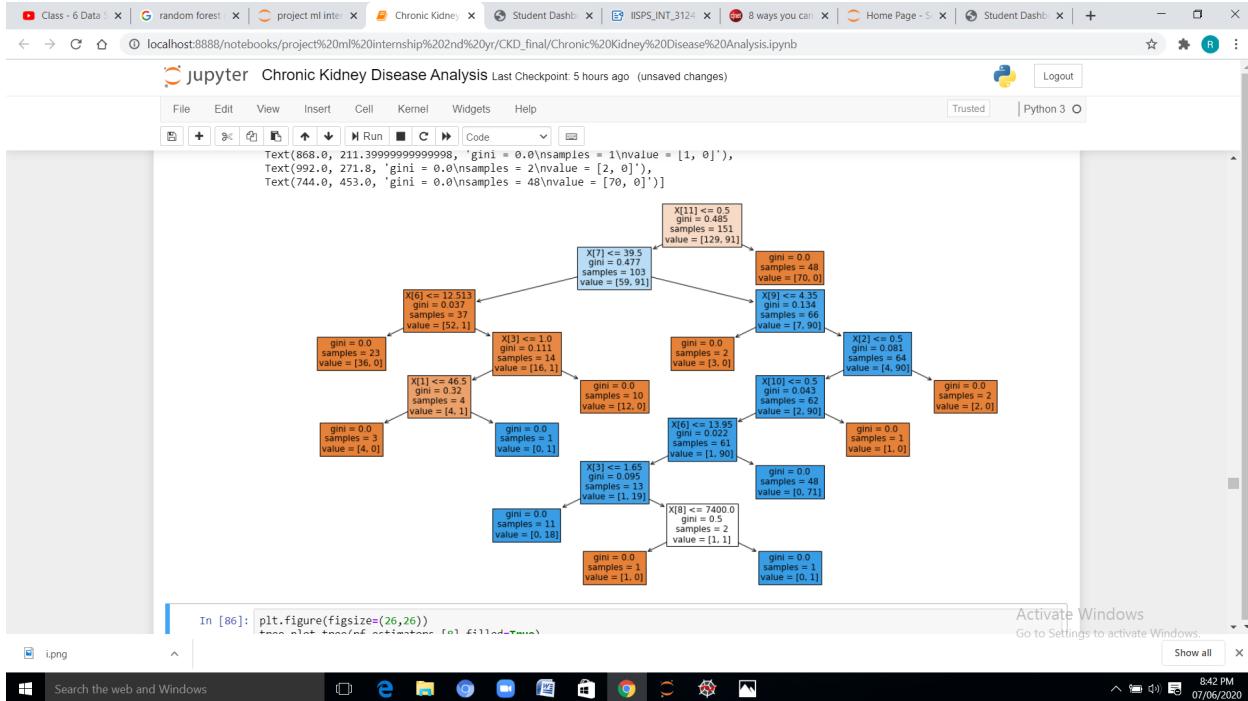
DATA VISUALIZATION

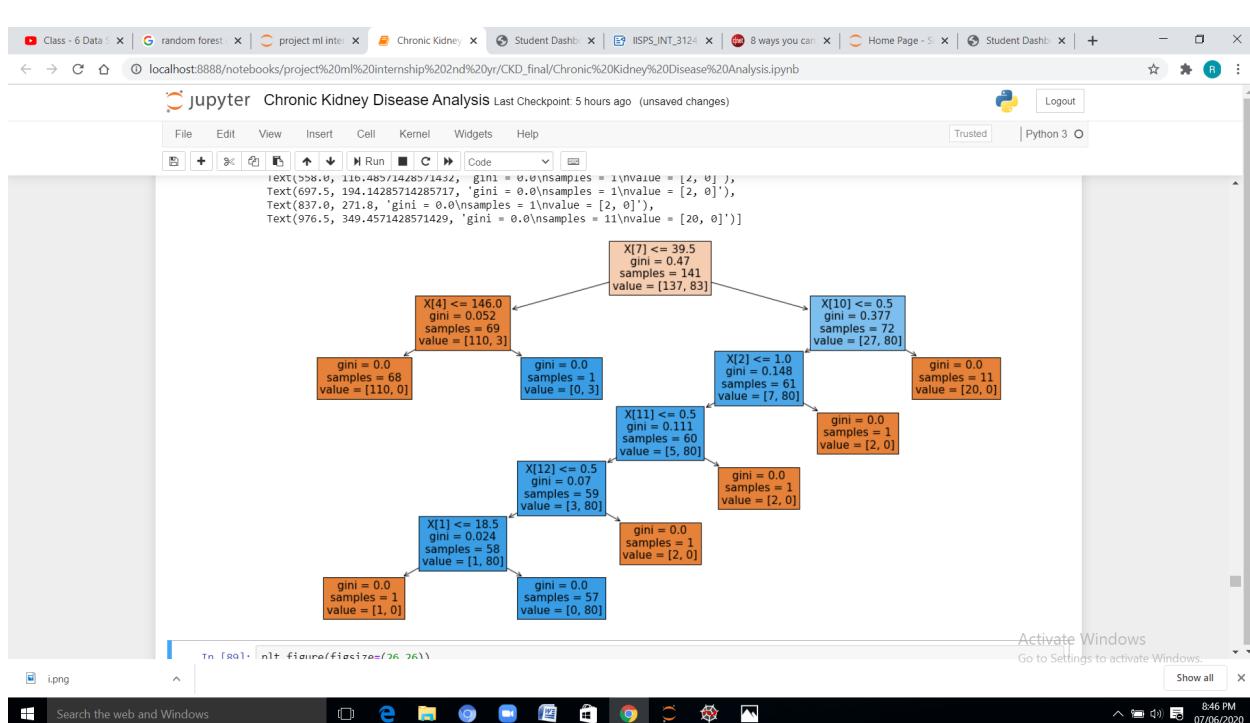
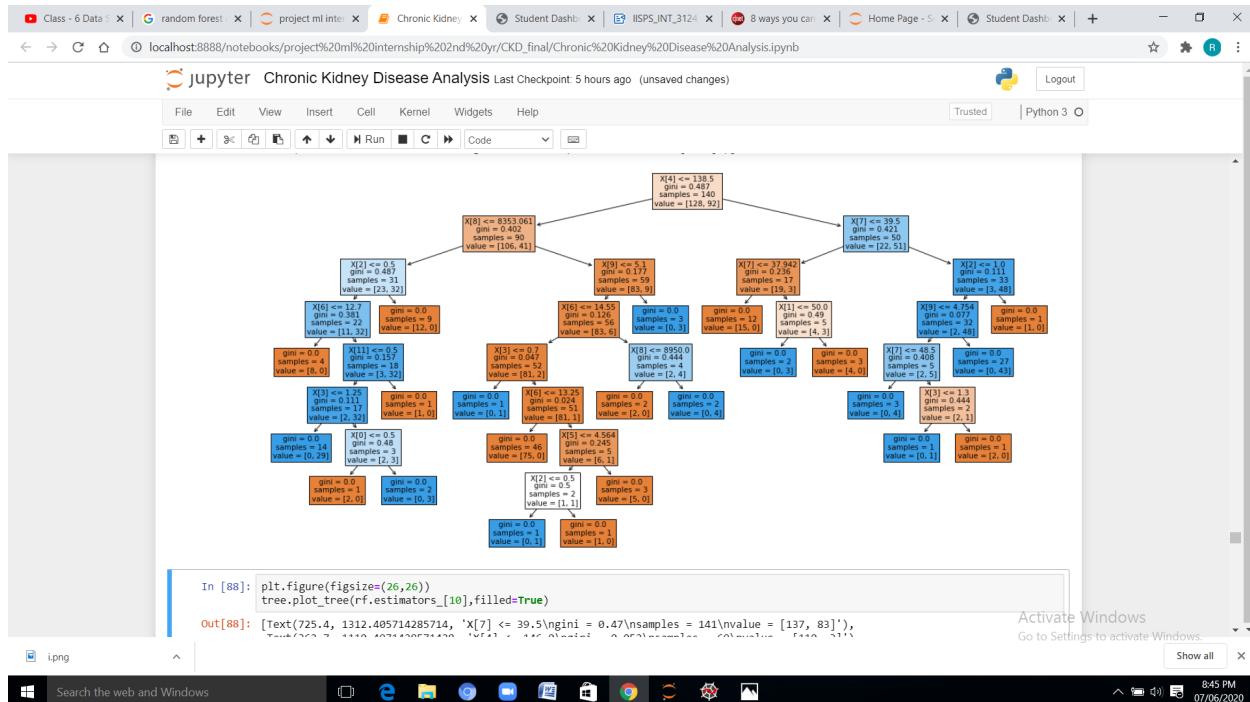


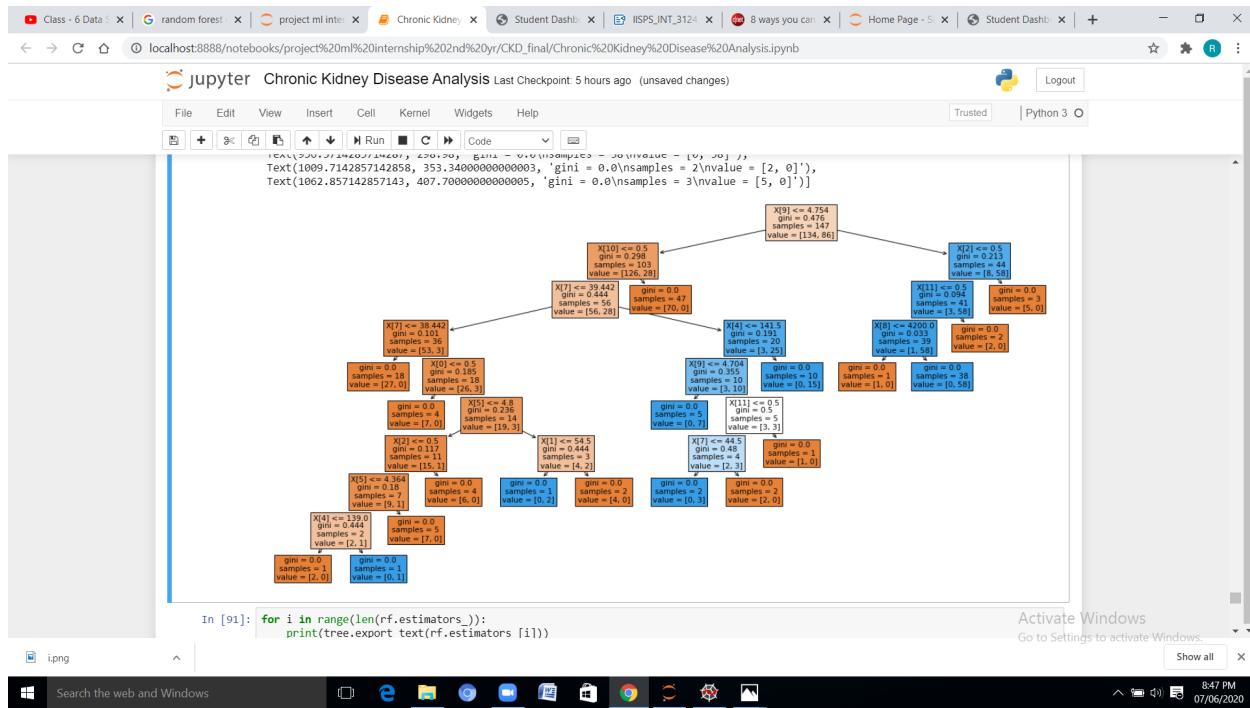
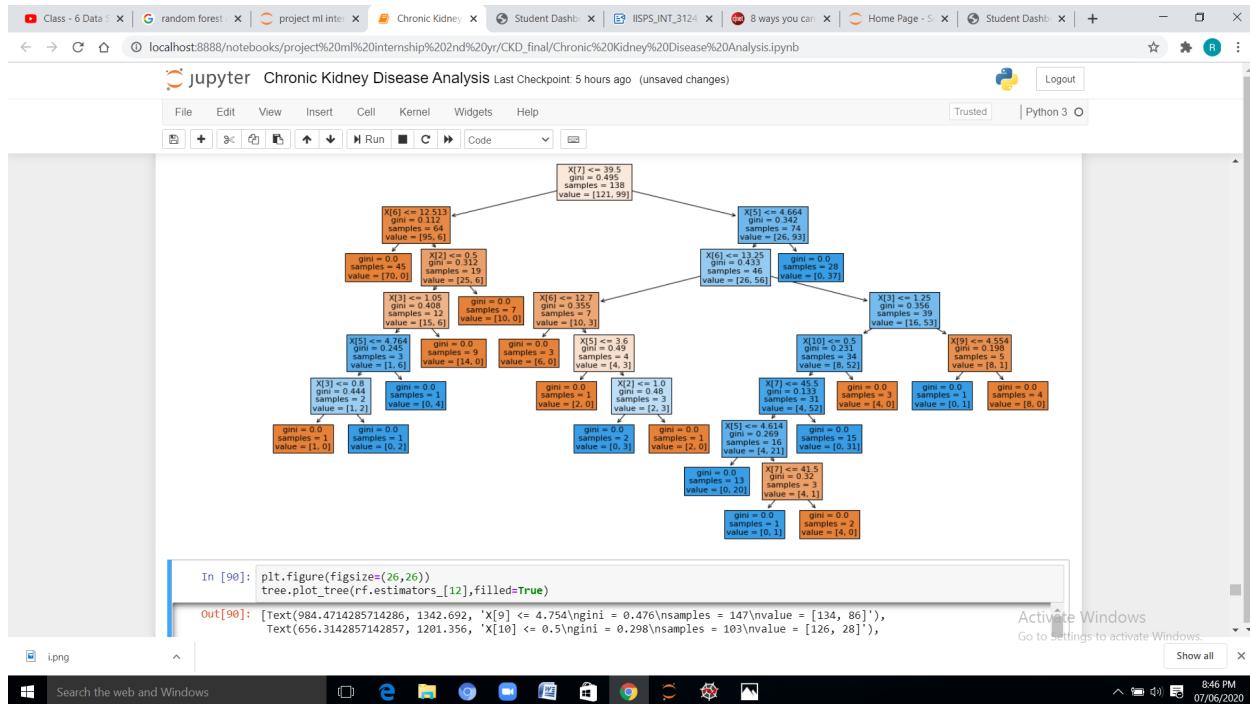












SPLITTING THE DATA INTO TRAIN AND TEST

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In [66]: `from sklearn.model_selection import train_test_split`

In [67]: `x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=0)`

In [68]: `x_train.shape`

Out[68]: `(220, 13)`

In [69]: `x_test.shape`

Out[69]: `(56, 13)`

Split into train and test

In [70]: `from sklearn import tree`
`from sklearn.pipeline import Pipeline`
`from sklearn.ensemble import RandomForestClassifier`

In [71]: `rf=RandomForestClassifier(n_estimators=13,random_state=0)`

In [72]: `rf.fit(x_train,y_train)`

Out[72]: `RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini', max_depth=None, max_features='auto', max_leaf_nodes=None, n_estimators=13, random_state=0, verbose=0, warm_start=False)`

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TRAIN AND TESTING THE DATA

Jupyter Chronic Kidney Disease Analysis Last Checkpoint 5 hours ago (autosaved)

File Edit View Insert Cell Kernel Widgets Help

In [70]: `from sklearn import tree`
`from sklearn.pipeline import Pipeline`
`from sklearn.ensemble import RandomForestClassifier`

In [71]: `rf=RandomForestClassifier(n_estimators=13,random_state=0)`

In [72]: `rf.fit(x_train,y_train)`

Out[72]: `RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini', max_depth=None, max_features='auto', max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, min_samples_leaf=1, min_samples_split=2, min_weight_fraction_leaf=0.0, n_estimators=13, n_jobs=None, oob_score=False, random_state=0, verbose=0, warm_start=False)`

In [73]: `y_pred=rf.predict(x_test)`
`y_pred`

Out[73]: `array([1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0])`

In [74]: `from sklearn.metrics import accuracy_score`
`accuracy_score(y_test,y_pred)`

Out[74]: `0.9464285714285714`

Scaling and Model Building

Saving the Model

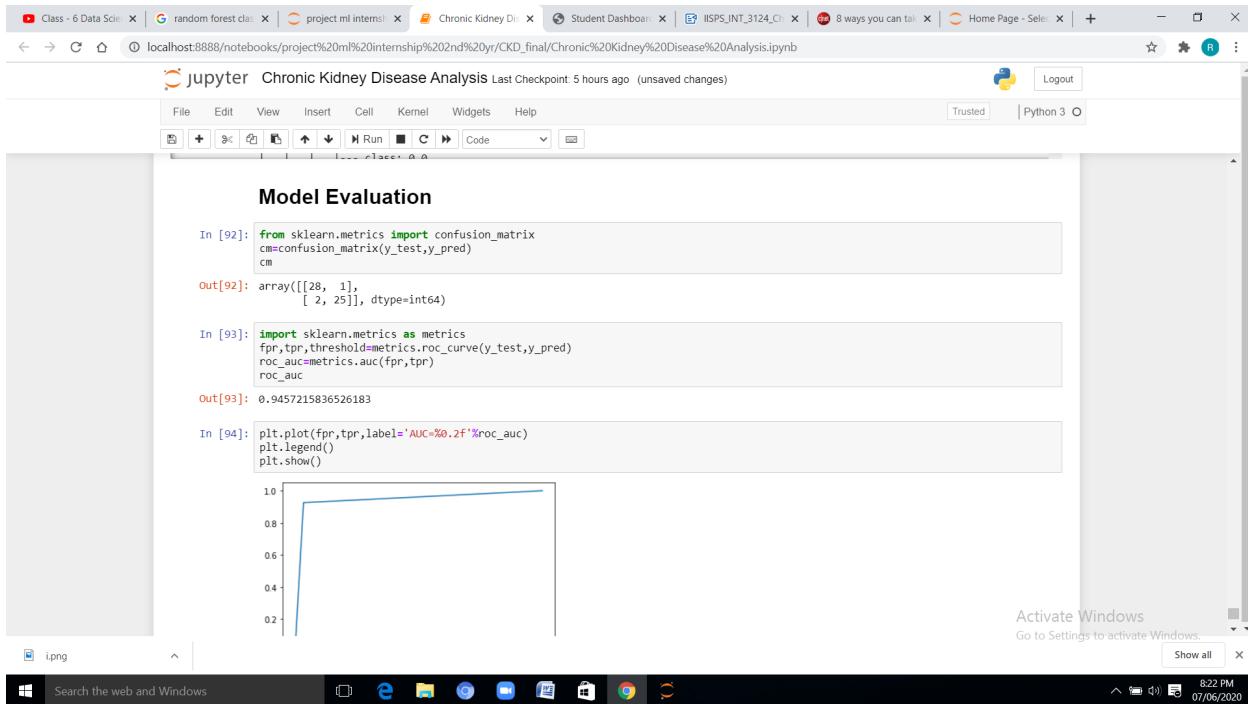
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Show all

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MODEL EVALUATION



CREATING HTML FILE

The screenshot shows the Spyder Python IDE interface. A file named "index.html" is open in the editor. The code in the file is:

```
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<title>Chronic Kidney Disease Analysis</title>
<link href="https://fonts.googleapis.com/css?family=Pacifico" rel="stylesheet" type="text/css">
<link href="https://fonts.googleapis.com/css?family=Arimo" rel="stylesheet" type="text/css">
<link href="https://fonts.googleapis.com/css?family=Hind:300" rel="stylesheet" type="text/css">
<link href="https://fonts.googleapis.com/css?family=Open+Sans+Condensed:300" rel="stylesheet" type="text/css">
<link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
<!--<link rel="stylesheet" href="{{ url_for('static', filename='css/style.css') }}>-->
<style>
.login {
    top: 20%;
}
div{
    color: black;
}
.button{
    background-color: #0066cc;
    color: white;
    border-radius: 3px;
}
.select{
    color:black;
}
</style>
</head>
<body style="background-image: linear-gradient(t bottom right, #ffe6e6, #cce6ff);>
<div class="login">
<h1 style="text-align: center;">CHRONIC KIDNEY DISEASE ANALYSIS</h1>
<div style="margin: 3em;">
    The term "chronic kidney disease" means lasting damage to the kidneys that can get worse over time. If the damage is very bad, your kidneys may stop working. This is called kidney failure, or end-stage renal disease (ESRD). If your kidneys fail, you will need dialysis or a kidney transplant.
    Anyone can get CKD. Some people are more at risk than others.
    Chronic kidney disease includes conditions that damage your kidneys and decrease their ability to keep healthy by doing the jobs listed. If kidney disease gets worse, wastes can build to high levels in your blood and make you feel sick. You may develop complications like high blood pressure, anemia (low h1
```

On the right side of the interface, there is a "File explorer" window showing two files: "index.html" and "predict.html". Below it is a "Python console" window with the following output:

```
Python 3.7.4 (default, Aug  9 2019, 18:34:13) [MSC v.1915 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.
IPython 7.8.0 -- An enhanced Interactive Python.

In [1]:
```

Spyder (Python 3.7)

File Edit Search Source Run Debug Consoles Projects Tools View Help

Editor - C:\Users\rayudu.sushma\project ml internship 2nd yr\CKD_final\templates\index.html

temp.py app.py - project ml internship 2nd yr...app.py - CKD_final index.html

```
<h1 style="text-align: center;">CHRONIC KIDNEY DISEASE ANALYSIS</h1>
<div style="margin: 3em;">
    The term "chronic kidney disease" means lasting damage to the kidneys that can get worse over time. If the damage is very bad, your kidneys may stop working. This is called kidney failure, or end-stage renal disease (ESRD). If your kidneys fail, you will need dialysis or a kidney transplant in order to live.
    Anyone can get CKD. Some people are more at risk than others.
    Chronic kidney disease includes conditions that damage your kidneys and decrease their ability to keep healthy levels of wastes from your blood. If kidney disease gets worse, wastes can build to high levels in your blood and make you feel sick. You may develop complications like high blood pressure, anemia (low red blood count), weak bones, poor nutritional health and nerve damage. Also, kidney disease increases your risk for heart and blood vessel disease. These problems may happen slowly over a long period of time. Kidney disease may be caused by diabetes, high blood pressure and other disorders. Early detection and treatment can often keep chronic kidney disease from getting worse. When kidney disease progresses, it eventually leads to kidney failure, which requires dialysis or a kidney transplant to maintain life.
</div>
<div class="container-fluid">
    <div class="row">
        <div class="col-sm-8">
            <br />
            <div>
                <h3>Cause:</h3>
                Some things that increase your risk for CKD include:
                <ul>
                    <li>Diabetes</li>
                    <li>High blood pressure (hypertension)</li>
                    <li>Heart disease</li>
                    <li>Having a family member with kidney disease</li>
                    <li>Being over 60 years old</li>
                </ul>
            </div>
            <div>
                <h3>Symptoms</h3>
                You may notice one or more of the following symptoms if your kidneys are beginning to fail:
                <ul>
                    <li>Itching</li>
                    <li>Muscle cramps</li>
                    <li>Nausea and vomiting</li>
                </ul>
            </div>
        </div>
    </div>
</div>
```

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Python console History log

Permissions: RW End-of-lines: CRLF Encoding: UTF-8 GUESSED Line: 1 Column: 1 Memory: 56 %

8:54 PM 07/06/2020

Spyder (Python 3.7)

File Edit Search Source Run Debug Consoles Projects Tools View Help

Editor - C:\Users\rayudu.sushma\project ml internship 2nd yr\CKD_final\templates\index.html

temp.py app.py - project ml internship 2nd yr...app.py - CKD_final index.html

```
<div class="row">
    <div class="col-sm-8">
        <br />
        <div>
            <h3>Cause:</h3>
            Some things that increase your risk for CKD include:
            <ul>
                <li>Diabetes</li>
                <li>High blood pressure (hypertension)</li>
                <li>Heart disease</li>
                <li>Having a family member with kidney disease</li>
                <li>Being over 60 years old</li>
            </ul>
        </div>
        <div>
            <h3>Symptoms</h3>
            You may notice one or more of the following symptoms if your kidneys are beginning to fail:
            <ul>
                <li>Itching</li>
                <li>Muscle cramps</li>
                <li>Nausea and vomiting</li>
                <li>Not feeling hungry</li>
                <li>Swelling in your feet and ankles</li>
                <li>Too much urine (pee) or not enough urine</li>
                <li>Trouble catching your breath</li>
                <li>Trouble sleeping</li>
            </ul>
        </div>
        <div>
            <h3>Prevention:</h3>
            Diabetes and high blood pressure are the most common causes of CKD. If you have diabetes or high blood pressure, working with your doctor to keep your blood sugar and blood pressure under control is the best way to prevent kidney disease.
            Living a healthy lifestyle can help prevent diabetes, high blood pressure and kidney disease. It can also help keep them under control. Follow these tips to lower your risk for kidney disease and prevent problems that cause it:
            <ul>
            </ul>
        </div>
    </div>
</div>
```

Activate Windows
Go to Settings to activate Windows.

Python console History log

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Spyder (Python 3.7)

File Edit Search Source Run Debug Consoles Projects Tools View Help

Editor - C:\Users\rayudu.sushma\project ml internship 2nd yr\CKD_final\templates\index.html

```

78         <li>Trouble catching your breath</li>
79         <li>Trouble sleeping</li>
80     </ul>
81 
82     <div>
83         <h3>Prevention</h3>
84         Diabetes and high blood pressure are the most common causes of CKD. If you have diabetes
85         and high blood pressure, working with your doctor to keep your blood sugar and blood pressure under
86         control is the best way to prevent kidney disease.
87 
88         Living a healthy lifestyle can help prevent diabetes, high blood pressure and kidney disease and
89         help keep them under control. Follow these tips to lower your risk for kidney disease and
90         problems that cause it:
91         <ul>
92             <li>Follow a low-salt, low-fat diet</li>
93             <li>Exercise at least 30 minutes on most days of the week</li>
94             <li>Have regular check-ups with your doctor</li>
95             <li>Do not smoke or use tobacco</li>
96             <li>Limit alcohol</li>
97         </ul>
98 
99     <div>
100        <h3>Treatment</h3>
101        Damage to your kidneys is usually permanent. Although the damage cannot be fixed, you can
102        steps to keep your kidneys as healthy as possible for as long as possible. You may even
103        need dialysis or a kidney transplant to survive.
104        <ul>
105            <li>Control your blood sugar if you have diabetes.</li>
106            <li>Keep a healthy blood pressure.</li>
107            <li>Follow a low-salt, low-fat diet. </li>
108            <li>Exercise at least 30 minutes on most days of the week.</li>
109            <li>Keep a healthy weight.</li>
110            <li>Do not smoke or use tobacco.</li>
111            <li>Limit alcohol.</li>
112            <li>Talk to your doctor about medicines that can help protect your kidneys.</li>
113        </ul>
114 
115        If you catch kidney disease early, you may be able to prevent kidney failure. If your kidneys
116        fail, you will need dialysis or a kidney transplant to survive.
117    </div>
118 
```

File explorer

Name	Size	Type	Date Modified
index.html	9 KB	html File	07/06/2020 3:30 PM
predict.html	90 bytes	html File	07/06/2020 3:30 PM

Help Variable explorer File explorer

Python console

Python 3.7.4 (default, Aug 9 2019, 18:34:13) [MSC v.1915 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

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Python console History log
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Spyder (Python 3.7)

File Edit Search Source Run Debug Consoles Projects Tools View Help

Editor - C:\Users\rayudu.sushma\project ml internship 2nd yr\CKD_final\templates\index.html

```

99 
100     <div>
101         <h3>Treatment</h3>
102         Damage to your kidneys is usually permanent. Although the damage cannot be fixed, you can
103         steps to keep your kidneys as healthy as possible for as long as possible. You may even
104         need dialysis or a kidney transplant to survive.
105         <ul>
106             <li>Control your blood sugar if you have diabetes.</li>
107             <li>Keep a healthy blood pressure.</li>
108             <li>Follow a low-salt, low-fat diet. </li>
109             <li>Exercise at least 30 minutes on most days of the week.</li>
110             <li>Keep a healthy weight.</li>
111             <li>Do not smoke or use tobacco.</li>
112             <li>Limit alcohol.</li>
113             <li>Talk to your doctor about medicines that can help protect your kidneys.</li>
114         </ul>
115 
116         If you catch kidney disease early, you may be able to prevent kidney failure. If your kidneys
117         fail, you will need dialysis or a kidney transplant to survive.
118     </div>
119 
120     </div>
121     <div class="col-sm-4">
122         <h3>Predictor</h3>
123         <div>[{"prediction_text"}]</div>
124         <form action="{{ url_for('y_predict') }}" method="post">
125             <select name="rbc" required="required" class="select">
126                 <option value="">>red blood cells</option>
127                 <option value=1>normal</option>
128                 <option value=0>abnormal</option>
129             </select>
130             <br>
131             <br>
132             <input type="text" name="age" placeholder="Age" required="required" />
133             <br>
134             <br>
135             <input type="text" name="al" placeholder="Albumin" required="required" />
136             <br>
137             <br>
138             <input type="text" name="sc" placeholder="Serum Creatinine" required="required" />
139             <br>
140         </form>
141     </div>
142 
```

File explorer

Name	Size	Type	Date Modified
index.html	9 KB	html File	07/06/2020 3:30 PM
predict.html	90 bytes	html File	07/06/2020 3:30 PM

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Python console History log
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Spyder (Python 3.7)

File Edit Search Source Run Debug Consoles Projects Tools View Help

Editor - C:\Users\rayudu sushma\project ml internship 2nd yr\CKD_final\templates\index.html

temp.py app.py - project ml internship 2nd yr...| project ml internship 2nd yr app.py - CKD_final index.html

```
120     </div>
121     <div class="col-sm-4">
122         <h3>Predictor</h3>
123         <h4>({ prediction_text })</h4>
124         <form action="{{ url_for('y_predict') }}" method="post">
125             <select name="cbc" required="required" class="select">
126                 <option value="">red blood cells</option>
127                 <option value=1>normal</option>
128                 <option value=0>abnormal</option>
129             </select>
130             <br>
131             <br>
132             <input type="text" name="age" placeholder="Age" required="required" />
133             <br>
134             <br>
135             <input type="text" name="al" placeholder="Albumin" required="required" />
136             <br>
137             <br>
138             <input type="text" name="sc" placeholder="Serum Creatinine" required="required" />
139             <br>
140             <br>
141             <input type="text" name="sod" placeholder="Sodium" required="required" />
142             <br>
143             <br>
144             <input type="text" name="pot" placeholder="Potassium" required="required" />
145             <br>
146             <br>
147             <input type="text" name="hemo" placeholder="Haemoglobin" required="required" />
148             <br>
149             <br>
150             <input type="text" name="pcv" placeholder="Packed Cell Volume" required="required" />
151             <br>
152             <br>
153             <input type="text" name="wc" placeholder="White Blood Cells Count" required="required" />
154             <br>
155             <br>
156             <input type="text" name="rc" placeholder="Red Blood Cells Count" required="required" />
157             <br>
158             <br>
159             <select name="btn" required="required" class="select">
160                 <option value="">hypertension</option>
```

File explorer

Name	Size	Type	Date Modified
index.html	9 KB	html File	07/06/2020 3:30 PM
predict.html	90 bytes	html File	07/06/2020 3:30 PM

Help Variable explorer File explorer

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Spyder (Python 3.7)

File Edit Search Source Run Debug Consoles Projects Tools View Help

Editor - C:\Users\rayudu sushma\project ml internship 2nd yr\CKD_final\templates\index.html

temp.py app.py - project ml internship 2nd yr...| project ml internship 2nd yr app.py - CKD_final index.html

```
148             <input type="text" name="hemo" placeholder="Haemoglobin" required="required" />
149             <br>
150             <br>
151             <input type="text" name="pcv" placeholder="Packed Cell Volume" required="required" />
152             <br>
153             <br>
154             <input type="text" name="wc" placeholder="White Blood Cells Count" required="required" />
155             <br>
156             <br>
157             <input type="text" name="rc" placeholder="Red Blood Cells Count" required="required" />
158             <br>
159             <br>
160             <select name="btn" required="required" class="select">
161                 <option value="">hypertension</option>
162                 <option value=0>no</option>
163                 <option value=1>yes</option>
164             </select>
165             <br>
166             <br>
167             <select name="dm" required="required" class="select">
168                 <option value="">diabetes </option>
169                 <option value=0>no</option>
170                 <option value=1>yes</option>
171             </select>
172             <br>
173             <br>
174             <select name="ane" required="required" class="select">
175                 <option value="">anaemia </option>
176                 <option value=0>no</option>
177                 <option value=1>yes</option>
178             </select>
179             <br>
180             <br>
181             <button type="submit" class="button">Predict</button>
182         </form>
183         <br>
184         <br>
185         <br>
186         <br>
187         <br>
188         <br>
189         <br>
```

File explorer

Name	Size	Type	Date Modified
index.html	9 KB	html File	07/06/2020 3:30 PM
predict.html	90 bytes	html File	07/06/2020 3:30 PM

Help Variable explorer File explorer

Python console

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In [1]:

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Python console History log
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Spyder (Python 3.7)

File Edit Search Source Run Debug Consoles Projects Tools View Help

Editor - C:\Users\rayudu.sushma\project ml internship 2nd yr\CKD_final\templates\index.html

```

159         <select name="btn" required="required" class="select">
160             <option value="">hypertension</option>
161             <option value=0>no</option>
162             <option value=1>yes</option>
163         </select>
164         <br>
165         <br>
166         <select name="dm" required="required" class="select">
167             <option value="">diabetes </option>
168             <option value=0>no</option>
169             <option value=1>yes</option>
170         </select>
171         <br>
172         <br>
173         <select name="ane" required="required" class="select">
174             <option value="">anemia </option>
175             <option value=0>no</option>
176             <option value=1>yes</option>
177         </select>
178         <br>
179         <br>
180         <br>
181         <button type="submit" class="button">Predict</button>
182     </form>
183     <br>
184     <br>
185     <br>
186     <br>
187     </div>
188   </div>
189 </div>
190 </div>
191 </div>
192 </div>
193 </div>
194 </div>
195 </div>
196 </div>
197 </body>
198 </html>
199

```

File explorer

Name	Size	Type	Date Modified
index.html	9 KB	html File	07/06/2020 3:30 PM
predict.html	90 bytes	html File	07/06/2020 3:30 PM

Help Variable explorer File explorer

Python console

Console 1/A

```

Python 3.7.4 (default, Aug  9 2019, 18:34:13) [MSC v.1915 64 bit (AMD64)]
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IPython 7.8.0 -- An enhanced Interactive Python.

In [1]:

```

Activate Windows
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Python console History log
Permissions: RW End-of-lines: CRLF Encoding: UTF-8 GUESSED Line: 1 Column: 1 Memory: 56 %
8:54 PM 07/06/2020

BUILD PYTHON CODE

Spyder (Python 3.7)

File Edit Search Source Run Debug Consoles Projects Tools View Help

Editor - C:\Users\rayudu.sushma\project ml internship 2nd yr\CKD_final\app.py

```

1 #!/usr/bin/env python
2 """
3 Created on Sun Jul  5 12:47:00 2020
4
5 @author: rayudu.sushma
6 """
7 import numpy as np
8 from flask import Flask, request, jsonify, render_template
9
10 from joblib import load
11 app = Flask(__name__)
12 model = load(open('randomforest1.save', 'rb'))
13
14
15 @app.route('/')
16 def home(name=None):
17     return render_template('index.html', name=name)
18
19
20 @app.route('/y_predict', methods=['POST'])
21 def y_predict():
22
23     for rendering_results on HTML GUI
24     ...
25
26     x_test = [[x for x in request.form.values()]]
27     prediction=model.predict(x_test)
28     print(prediction)
29     if prediction[0]==0:
30         output="Chronic Kidney Disease"
31     else:
32         output="Not Chronic Kidney Disease"
33
34     return render_template('index.html', prediction_text='Prediction: {}'.format(output))
35
36
37 if __name__ == "__main__":
38     app.run(debug=True)
39
40

```

File explorer

Name	Size	Type	Date Modified
ipynb_checkpoints		File Folder	07/06/2020 3:30 PM
templates		File Folder	07/06/2020 3:30 PM
app.py	888 bytes	py File	07/06/2020 3:30 PM
Chronic Kidney Disease Analysis.ipynb	2.5 MB	ipynb File	07/06/2020 8:47 PM
chronic_dataset.csv	47 KB	csv File	07/06/2020 3:30 PM
randomforest1.save	29 KB	save File	07/06/2020 8:15 PM

Help Variable explorer File explorer

Python console

Console 1/A

```

Python 3.7.4 (default, Aug  9 2019, 18:34:13) [MSC v.1915 64 bit (AMD64)]
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In [1]:

```

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