Project Name:	Project - Early Detection of Chronic Kidney Disease using Machine Learning
Team ID:	PNT2022TMID13778

SPRINT 1

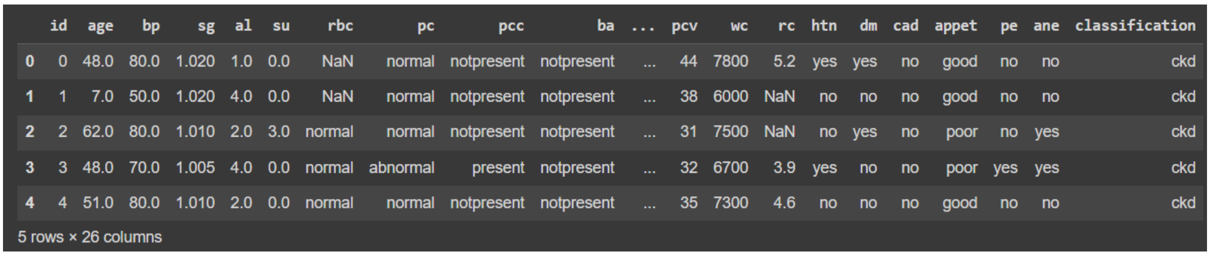
Collecting , Visualizing, and Preprocessing the Dataset

1.Importing the packages

```
import numpy as np

import pandas as pd

import matplotlib.pyplot as plt

from collections import Counter as c

import seaborn as sns

import missingno as msng

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
```

#Data Collections

```
data=pd.read_csv("/content/drive/MyDrive/chronickidneydisease.csv")

data.head()
```



	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

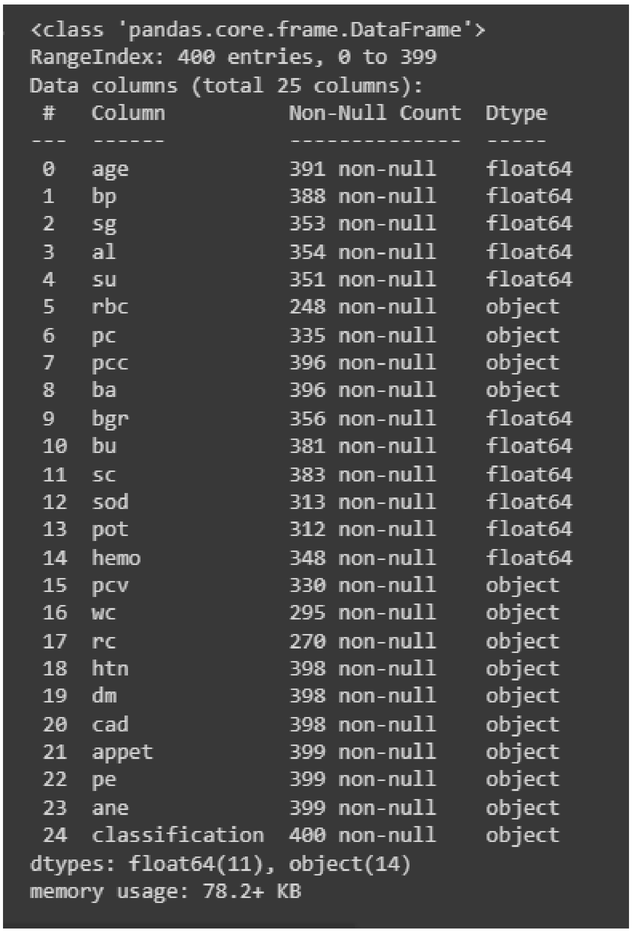
5 rows × 26 columns

```
data.drop(['id'],axis=1,inplace=True)

data.columns

data.columns=['age', 'bp', 'sg', 'al', 'su', 'rbc', 'pc', 'pcc', 'ba', 'bgr', 'bu',

    'sc', 'sod', 'pot', 'hemo', 'pcv', 'wc', 'rc', 'htn', 'dm', 'cad',

    'appet', 'pe', 'ane', 'classification']
```

data.columns

data['classification'].unique()

data.info()



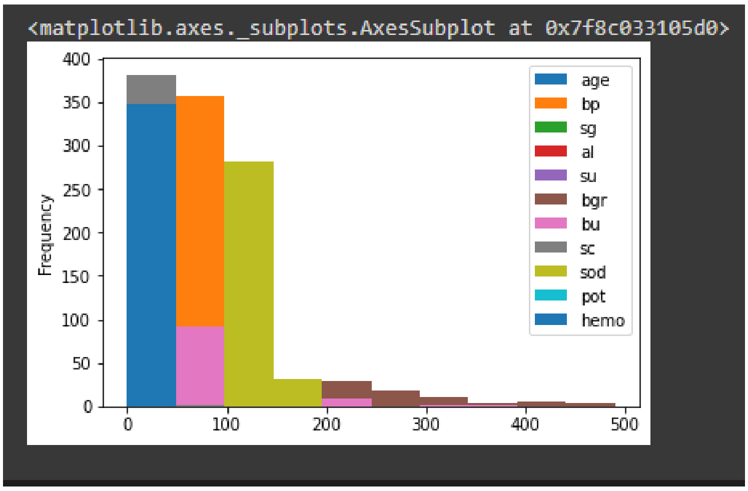
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 400 entries, 0 to 399
Data columns (total 25 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   age             391 non-null    float64
 1   bp              388 non-null    float64
 2   sg              353 non-null    float64
 3   al              354 non-null    float64
 4   su              351 non-null    float64
 5   rbc             248 non-null    object 
 6   pc              335 non-null    object 
 7   pcc             396 non-null    object 
 8   ba              396 non-null    object 
 9   bgr             356 non-null    float64
 10  bu              381 non-null    float64
 11  sc              383 non-null    float64
 12  sod             313 non-null    float64
 13  pot             312 non-null    float64
 14  hemo            348 non-null    float64
 15  pcv             330 non-null    object 
 16  wc              295 non-null    object 
 17  rc              270 non-null    object 
 18  htn             398 non-null    object 
 19  dm              398 non-null    object 
 20  cad             398 non-null    object 
 21  appet           399 non-null    object 
 22  pe              399 non-null    object 
 23  ane             399 non-null    object 
 24  classification  400 non-null    object 
dtypes: float64(11), object(14)
memory usage: 78.2+ KB
```

2. Data visualization

from matplotlib import pyplot

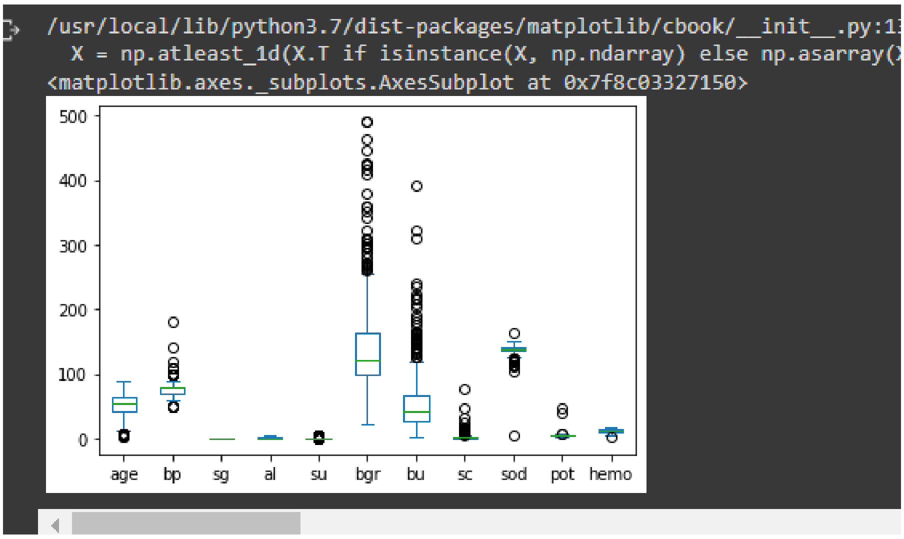
data.plot

data.plot.hist()



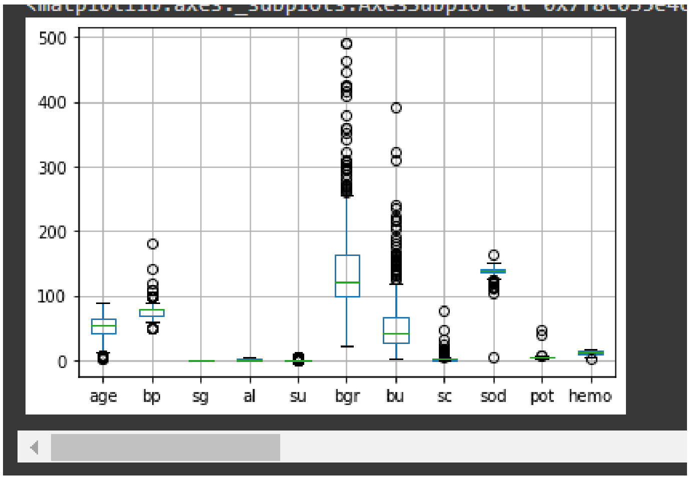
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8c033105d0>
```

data.plot.box()



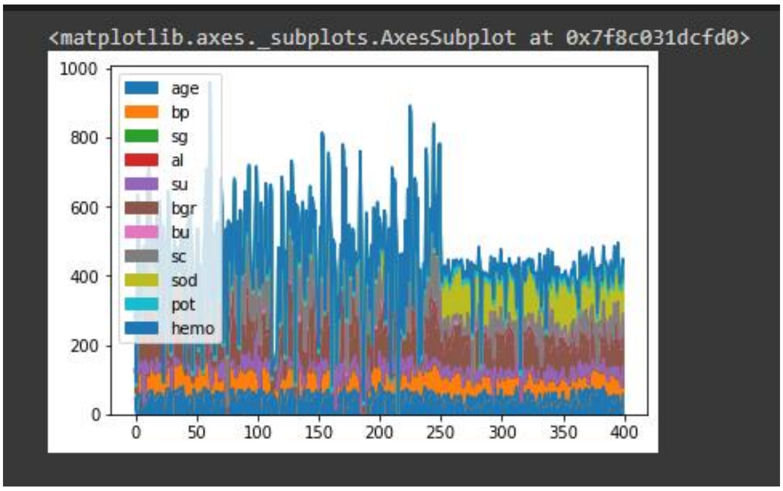
```
/usr/local/lib/python3.7/dist-packages/matplotlib/cbook/__init__.py:13
  X = np.atleast_1d(X.T if isinstance(X, np.ndarray) else np.asarray(X
<matplotlib.axes._subplots.AxesSubplot at 0x7f8c03327150>
```

data.boxplot()



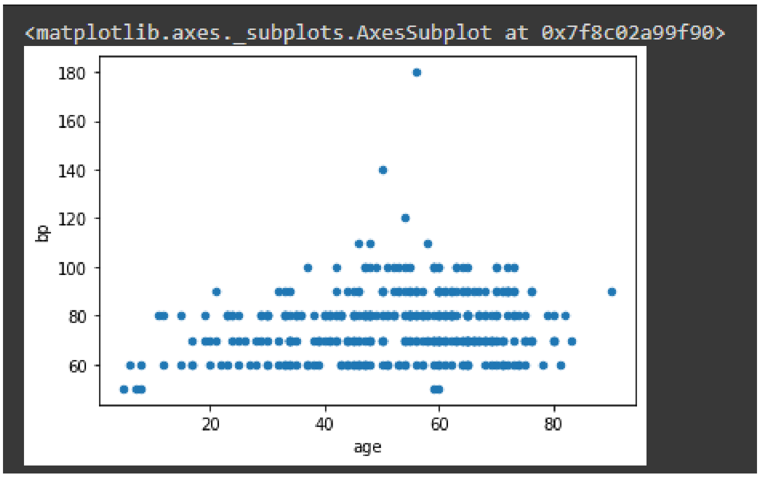
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8c035e4e
```

data.plot.area()



```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8c031dcfd0>
```

data.plot.scatter(x='age',y='bp')

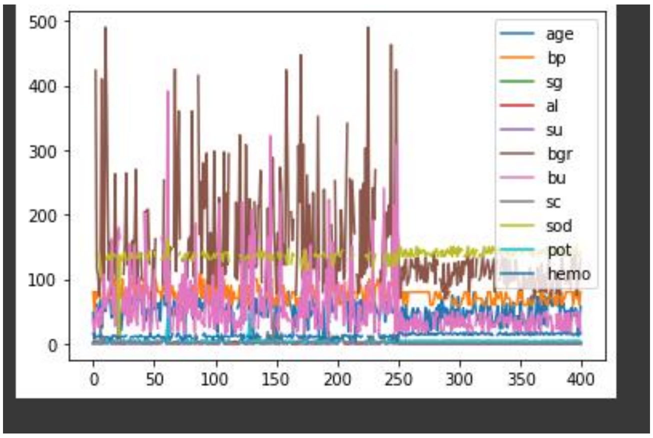


```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8c02a99f90>
```

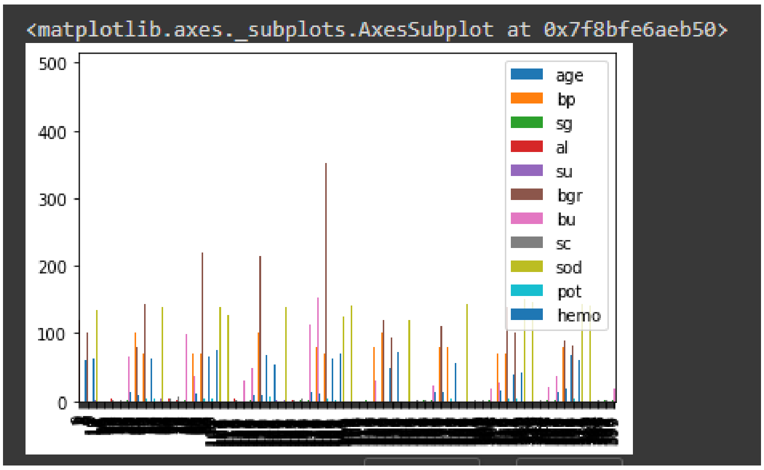
pie = data

pie

pie.plot();



data.plot.bar()



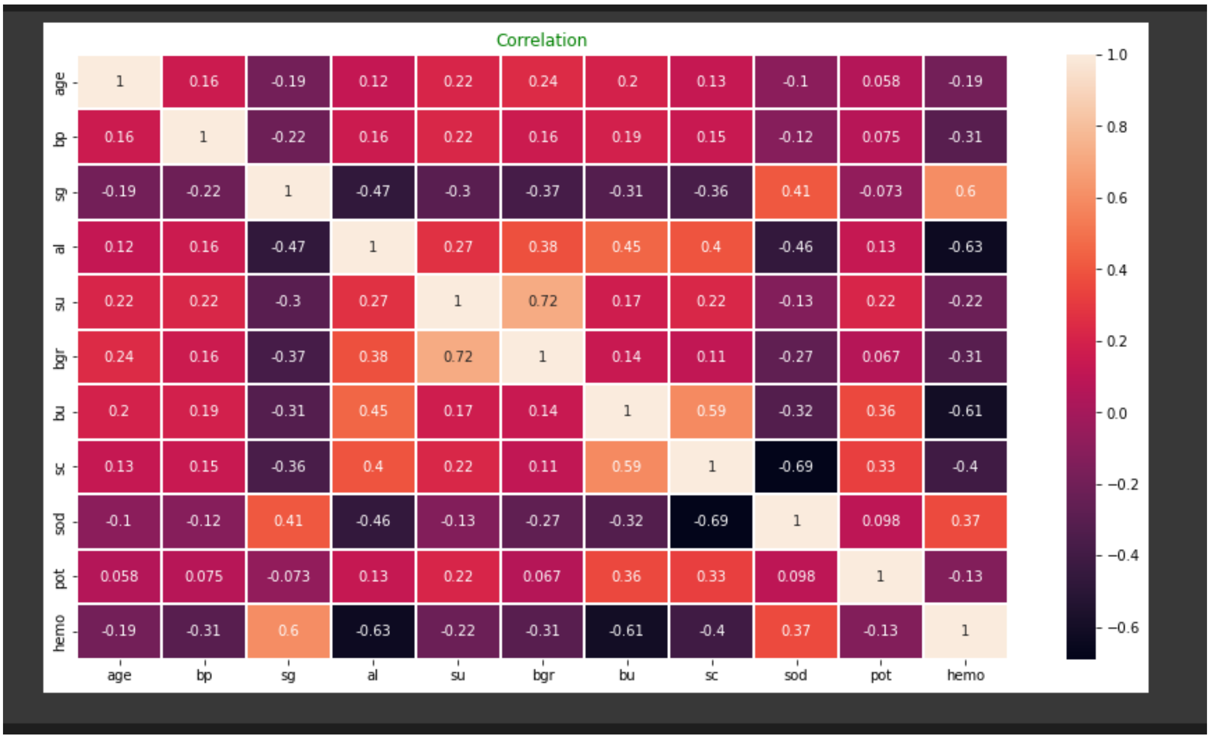
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8bfe6aeb50>
```

data.corr()

plt.figure(figsize=(15,8));

plt.title("Correlation",color="green")

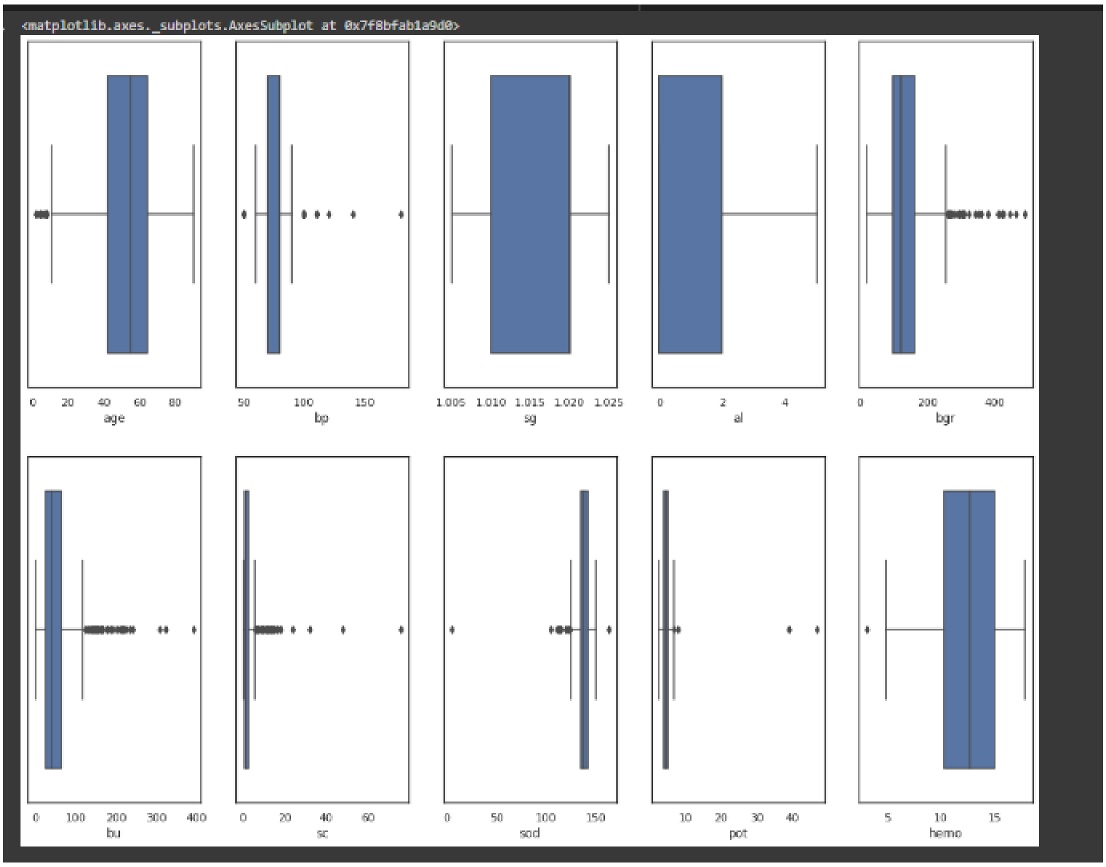
```
sns.heatmap(data.corr(),linewidth=1,annot=True);
```



Correlation

	age	bp	sg	al	su	bgr	bu	sc	sod	pot	hemo
age	1	0.16	-0.19	0.12	0.22	0.24	0.2	0.13	-0.1	0.058	-0.19
bp	0.16	1	-0.22	0.16	0.22	0.16	0.19	0.15	-0.12	0.075	-0.31
sg	-0.19	-0.22	1	-0.47	-0.3	-0.37	-0.31	-0.36	0.41	-0.073	0.6
al	0.12	0.16	-0.47	1	0.27	0.38	0.45	0.4	-0.46	0.13	-0.63
su	0.22	0.22	-0.3	0.27	1	0.72	0.17	0.22	-0.13	0.22	-0.22
bgr	0.24	0.16	-0.37	0.38	0.72	1	0.14	0.11	-0.27	0.067	-0.31
bu	0.2	0.19	-0.31	0.45	0.17	0.14	1	0.59	-0.32	0.36	-0.61
sc	0.13	0.15	-0.36	0.4	0.22	0.11	0.59	1	-0.69	0.33	-0.4
sod	-0.1	-0.12	0.41	-0.46	-0.13	-0.27	-0.32	-0.69	1	0.098	0.37
pot	0.058	0.075	-0.073	0.13	0.22	0.067	0.36	0.33	0.098	1	-0.13
hemo	-0.19	-0.31	0.6	-0.63	-0.22	-0.31	-0.61	-0.4	0.37	-0.13	1

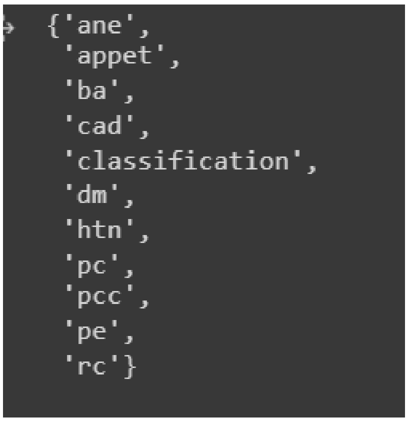
```
sns.set_theme(style="white")

fig, ((ax1, ax2,ax3,ax4,ax5), (ax6, ax7,ax8,ax9,ax10))= plt.subplots(nrows=2, ncols=5, figsize=(18,14))

sns.boxplot(data=data,x="age",ax=ax1)

sns.boxplot(data=data,x="bp",ax=ax2)

sns.boxplot(data=data,x="sg",ax=ax3)

sns.boxplot(data=data,x="al",ax=ax4)

sns.boxplot(data=data,x="bgr",ax=ax5)

sns.boxplot(data=data,x="bu",ax=ax6)

sns.boxplot(data=data,x="sc",ax=ax7)

sns.boxplot(data=data,x="sod",ax=ax8)

sns.boxplot(data=data,x="pot",ax=ax9)

sns.boxplot(data=data,x="hemo",ax=ax10)
```



```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8bfab1a9d0>
```

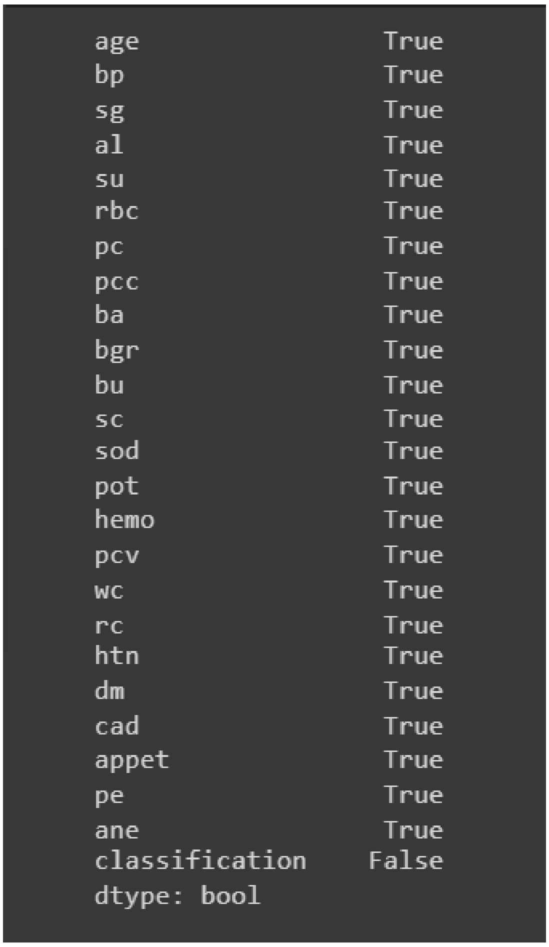
3. Data Preprocessing

```
data['classification']=data['classification'].replace("ckd\t",'ckd')

catcols=set(data.dtypes[data.dtypes=='O'].index.values)

print(catcols)

for i in catcols:

    print("columns:",i)

    print(c(data[i]))

    print('*'*120+'\n')

catcols.remove('rbc')

catcols.remove('pcv')

catcols.remove('wc')

catcols
```



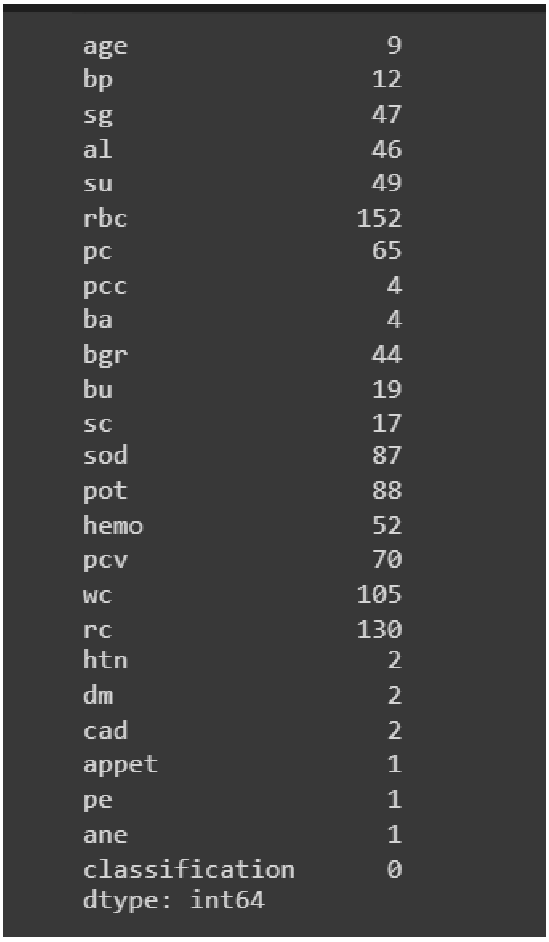
```
{'ane',
 'appet',
 'ba',
 'cad',
 'classification',
 'dm',
 'htn',
 'pc',
 'pcc',
 'pe',
 'rc'}
```

```
contcols=set(data.dtypes[data.dtypes!='O'].index.values)

contcols

for i in catcols:

    print("continuous columns :",i)

    print(c(data[i]))

    print('*'*120+'\n')

contcols.remove('sg')

contcols.remove('al')

contcols.remove('su')

print(contcols)

contcols.add('rbc')

contcols.add('pc')

contcols.add('wc')

print(contcols)

catcols.add('sg')

catcols.add('al')

catcols.add('su')

print(catcols)

data['cad']=data.cad.replace('\tno','no')

c(data['cad'])

data['dm']=data.dm.replace(to_replace={'\tno':'no','\tyes':'yes',' yes':'yes'})

c(data['dm'])

data.isna().any()
```



```
age               True
bp                True
sg                True
al                True
su                True
rbc               True
pc                True
pcc               True
ba                True
bgr               True
bu                True
sc                True
sod               True
pot               True
hemo              True
pcv               True
wc                True
rc                True
htn               True
dm                True
cad               True
appet             True
pe                True
ane               True
classification   False
dtype: bool
```

data.isna().sum()



```
age                9
bp                12
sg                47
al                46
su                49
rbc              152
pc                65
pcc                4
ba                 4
bgr               44
bu                19
sc                17
sod               87
pot               88
hemo              52
pcv               70
wc               105
rc               130
htn                2
dm                 2
cad                2
appet              1
pe                 1
ane                1
classification     0
dtype: int64
```

```
data.pcv=pd.to_numeric(data.pcv,errors='coerce')

data.wc=pd.to_numeric(data.wc,errors='coerce')

data.rc=pd.to_numeric(data.rc,errors='coerce')

data['bgr'].fillna(data['bgr'].mean(),inplace=True)

data['bp'].fillna(data['bp'].mean(),inplace=True)

data['bu'].fillna(data['bu'].mean(),inplace=True)

data['hemo'].fillna(data['hemo'].mean(),inplace=True)

data['pcv'].fillna(data['pcv'].mean(),inplace=True)

data['pot'].fillna(data['pot'].mean(),inplace=True)

data['rc'].fillna(data['rc'].mean(),inplace=True)

data['sc'].fillna(data['sc'].mean(),inplace=True)

data['sod'].fillna(data['sod'].mean(),inplace=True)

data['wc'].fillna(data['wc'].mean(),inplace=True)

data['age'].fillna(data['age'].mode()[0],inplace=True)

data['htn'].fillna(data['htn'].mode()[0],inplace=True)
```

```
data['pcc'].fillna(data['pcc'].mode()[0],inplace=True)

data['appet'].fillna(data['appet'].mode()[0],inplace=True)

data['al'].fillna(data['al'].mode()[0],inplace=True)

data['pc'].fillna(data['pc'].mode()[0],inplace=True)

data['rbc'].fillna(data['rbc'].mode()[0],inplace=True)

data['cad'].fillna(data['cad'].mode()[0],inplace=True)

data['ba'].fillna(data['ba'].mode()[0],inplace=True)

data['ane'].fillna(data['ane'].mode()[0],inplace=True)

data['su'].fillna(data['su'].mode()[0],inplace=True)

data['dm'].fillna(data['dm'].mode()[0],inplace=True)

data['pe'].fillna(data['pe'].mode()[0],inplace=True)

data['sg'].fillna(data['sg'].mode()[0],inplace=True)
```