GOVERNMENTOFTAMILNADU

NaanMuthalvan -Project-BasedExperientialLearning

Early PredictionForChronicKidneyDiseaseDetection:AProgressiveApproach toHealthManagement

Submittedby
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1.INTRODUCTION

1.1 Overview:

Chronic Kidney Disease (CKD) is a major medical problem and can be cured if treated in theearly stages. Usually, people are not aware that medical tests we take for different purposes couldcontain valuable information concerning kidney diseases. Consequently, attributes of various medicaltests are investigated to distinguish which attributes may contain helpful information about thedisease. The information says that it helps us to measure the severity of the problem, the predictedsurvival of the patient after the illness, the pattern of the disease and work for curing the diseaseIntodays world as we know most of the people are facing so many disease and as this can be cured ifwe treat people in early stages this project can use a pretrained model to predict the Chronic KidneyDiseasewhichcanhelpintreatmentsofpeopleswhoaresufferfromthis disease.

1.2 Purpose

Chronickidneydisease(CKD)occurswhenthekidneysgradually losetheirfunctionovertime. ThereareseveralpotentialcausesofCKD,including

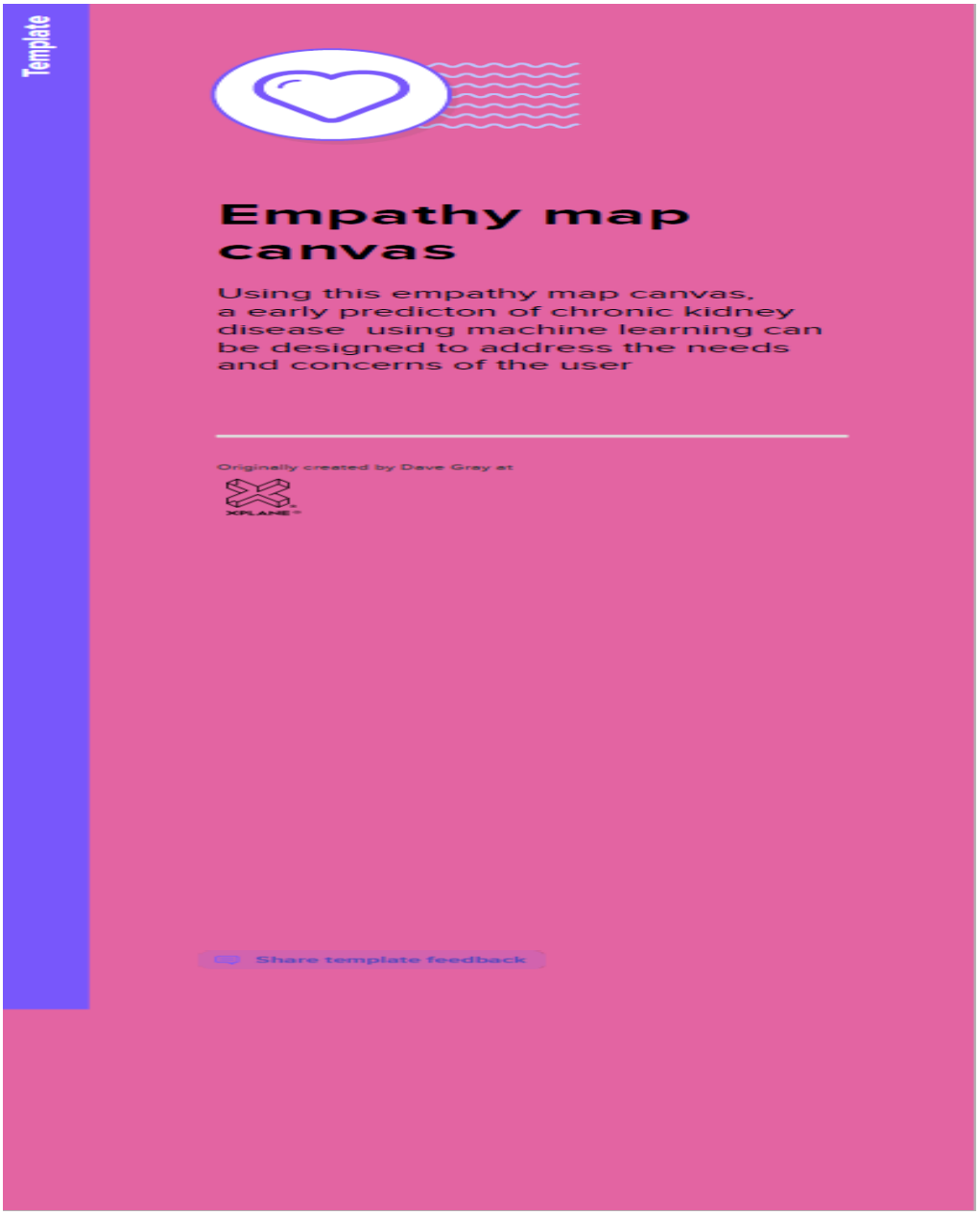
1. Diabetes:Highbloodsugarlevelscandamagethesmallbloodvessels inthekidneys,makingthemless effective atfilteringwaste andexcessfluidfromthebody.
2. Highbloodpressure:Highblood pressurecandamagethesmallblood vesselsinthekidneys,aswellasthedelicatefilteringunits callednephrons.
3. Glomerulonephritis: This is an inflammation of the tiny filters in the kidneys, which can causescarringandpermanentdamage.
4. Polycystickidneydisease:Thisisageneticconditionwherecystsdevelopinthekidneys,impairingth eirfunction.

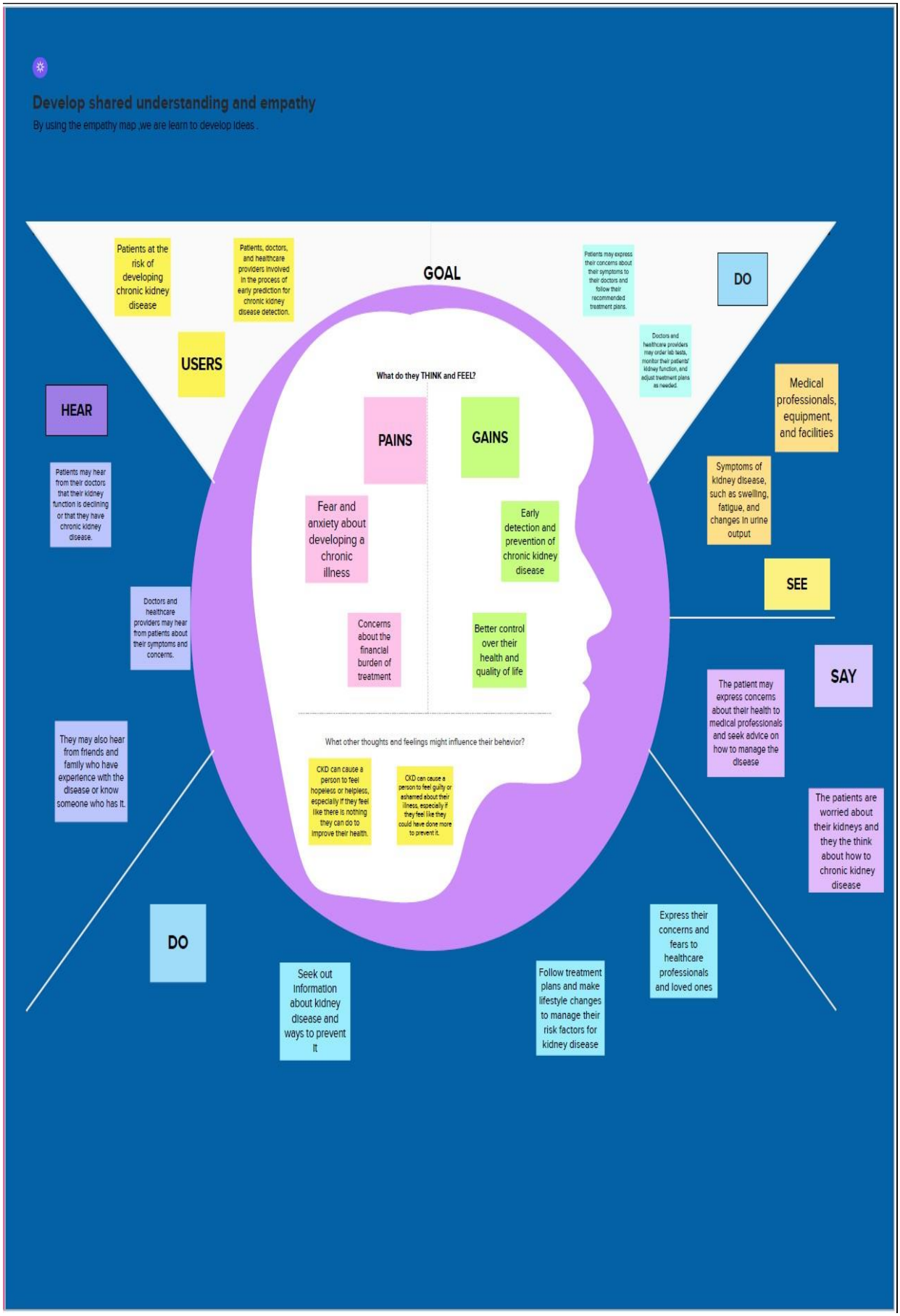
Otherconditions:Certainautoimmunediseases,infections,andgeneticdisorderscanalsoleadtoD

The purpose of the kidneys is to filter waste and excess fluid from the blood, maintaining a healthybalance ofelectrolytesandothersubstancesinthebody.

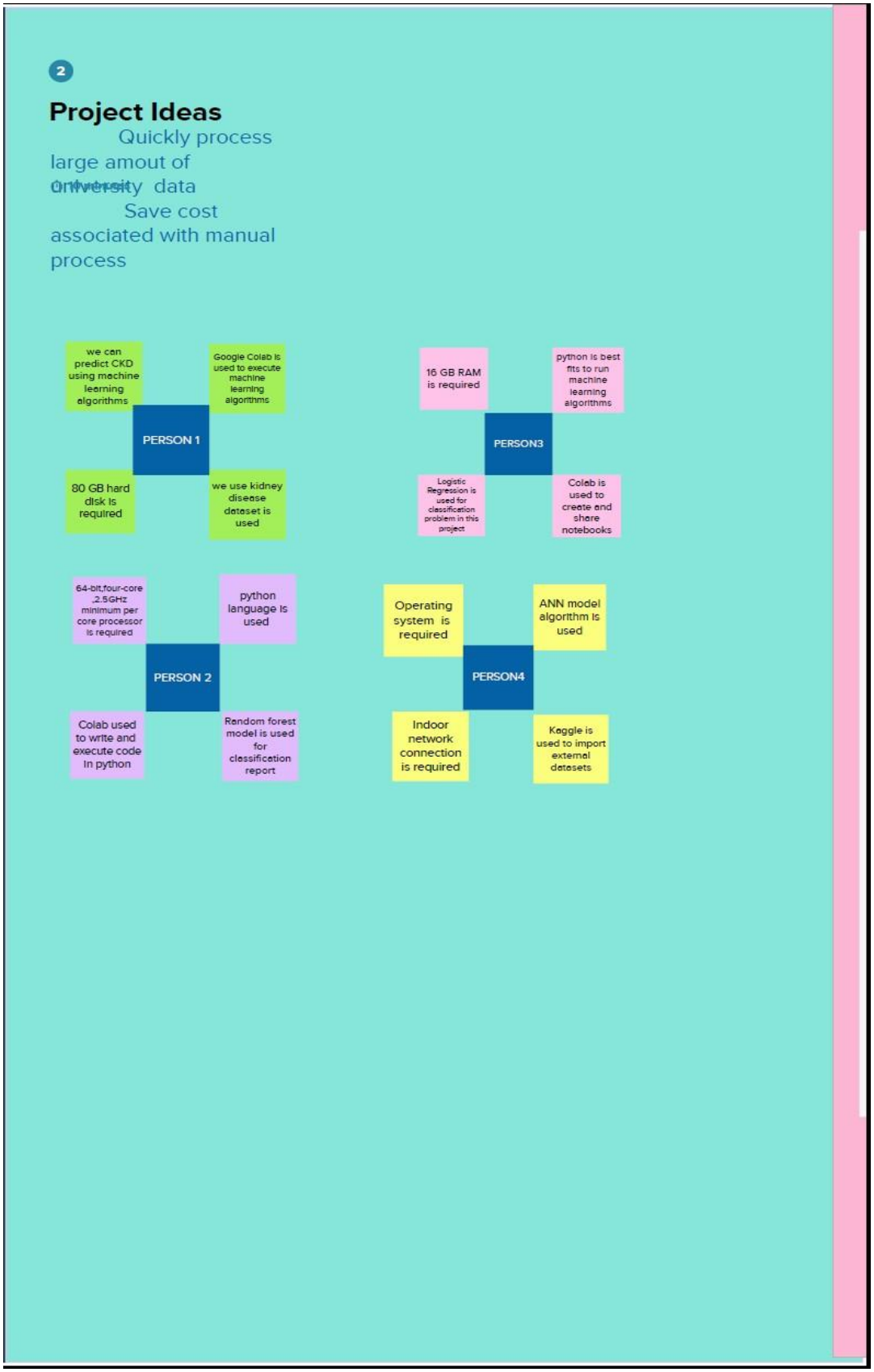
2. Problemdefinition&DesignThinking

2.1 EmpathyMap




Develop shared understanding and empathy
By using the empathy map ,we are learn to develop ideas .
GOAL
USERS
Patients at the risk of developing chronic kidney disease
Patients, doctors, and healthcare providers involved in the process of early prediction for chronic kidney disease detection.
DO
Patients may express their concerns about their symptoms to their doctors and follow their recommended treatment plans.
Doctors and healthcare providers may order lab tests, monitor their patients' kidney function, and adjust treatment plans as needed.
Medical professionals, equipment, and facilities
HEAR
Patients may hear from their doctors that their kidney function is declining or that they have chronic kidney disease.
Doctors and healthcare providers may hear from patients about their symptoms and concerns.
They may also hear from friends and family who have experience with the disease or know someone who has it.
What do they THINK and FEEL?
PAINS
GAINS
Fear and anxiety about developing a chronic illness
Early detection and prevention of chronic kidney disease
Concerns about the financial burden of treatment
Better control over their health and quality of life
What other thoughts and feelings might influence their behavior?
CKD can cause a person to feel hopeless or helpless, especially if they feel like there is nothing they can do to improve their health.
CKD can cause a person to feel guilty or ashamed about their illness, especially if they feel like they could have done more to prevent it.
SEE
Symptoms of kidney disease, such as swelling, fatigue, and changes in urine output
SAY
The patient may express concerns about their health to medical professionals and seek advice on how to manage the disease
The patients are worried about their kidneys and they the think about how to chronic kidney disease
DO
Seek out information about kidney disease and ways to prevent it
Follow treatment plans and make lifestyle changes to manage their risk factors for kidney disease
Express their concerns and fears to healthcare professionals and loved ones

2.2 Ideation&BrainstormingMap



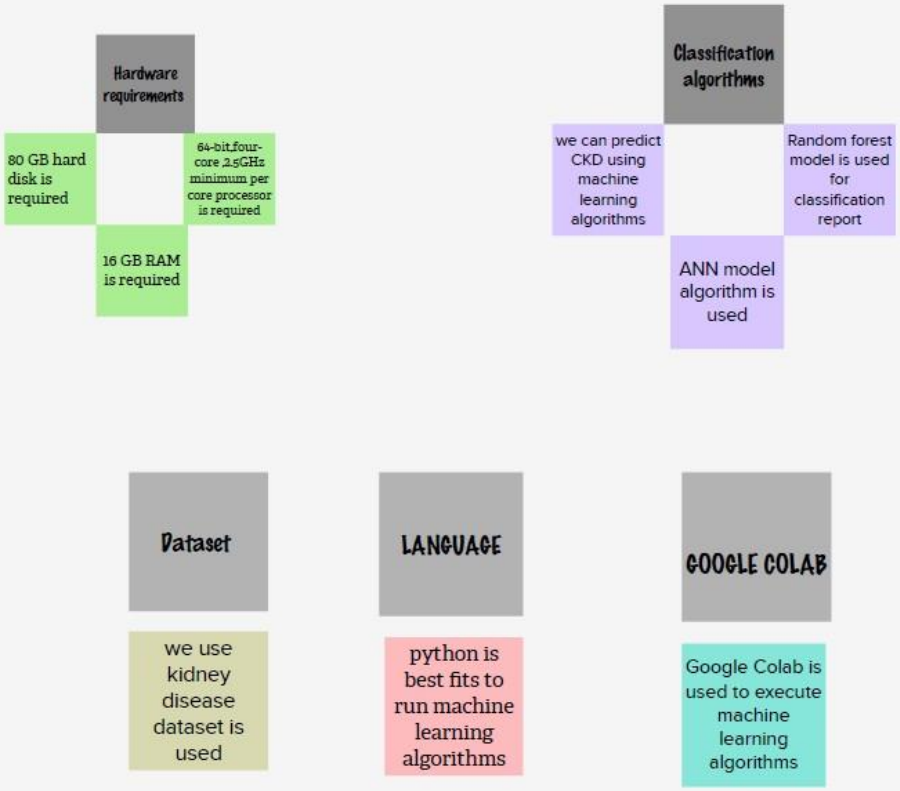
3

Group ideas

1. 64-bit processor,16 GB RAM is required
2. Machine learning algorithm such as ANN model, Logistic Regression, Random forest model is used.
3. Kidney disease dataset is used and it is import from kaggle.

20 minutes

4. Python language is used for execute Machine learning algorithms.
5. Google Colab is used to for executing Machine learning algorithms.

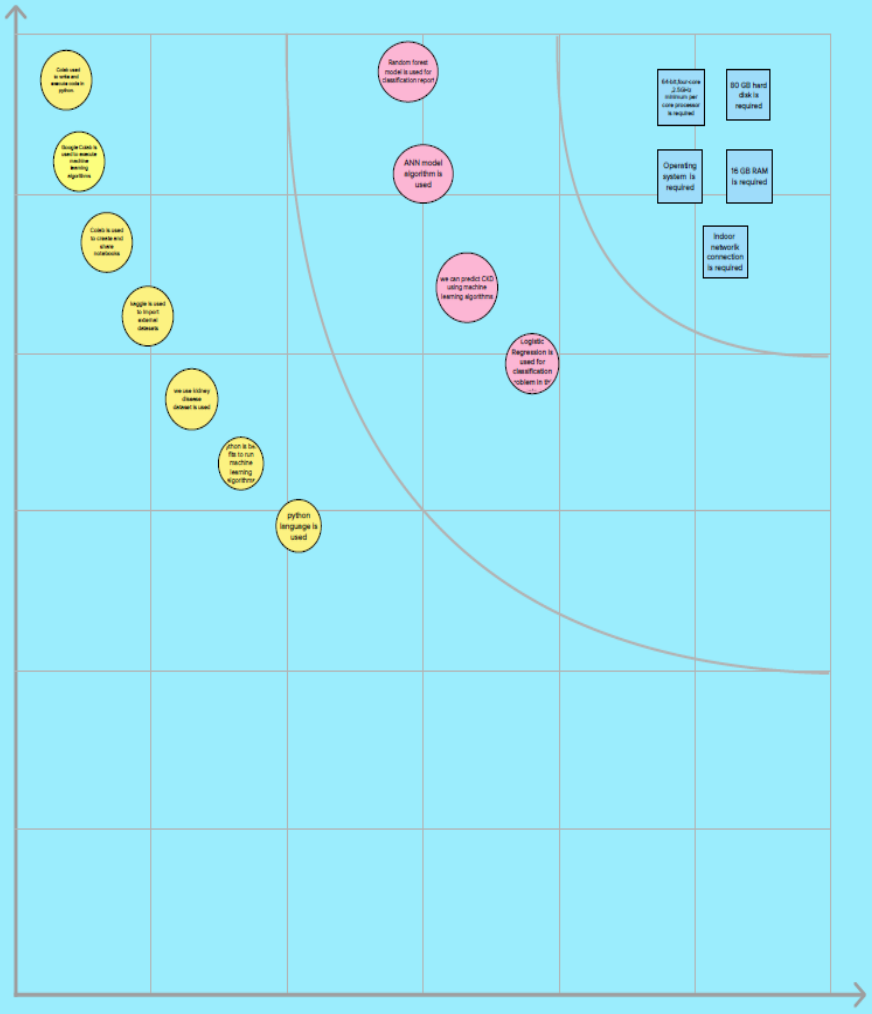


4

Prioritize

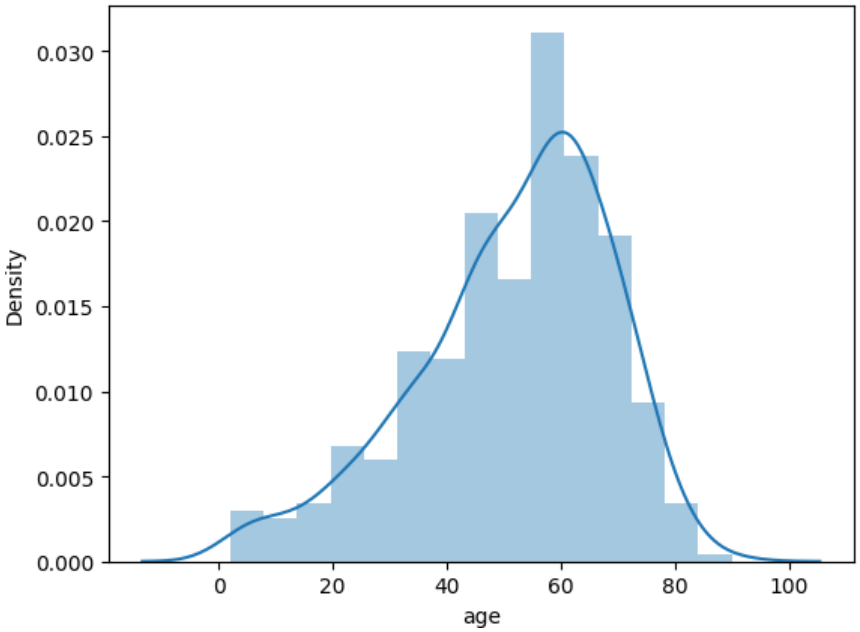
we prioritize the ideas based on the project requirements

20 minutes

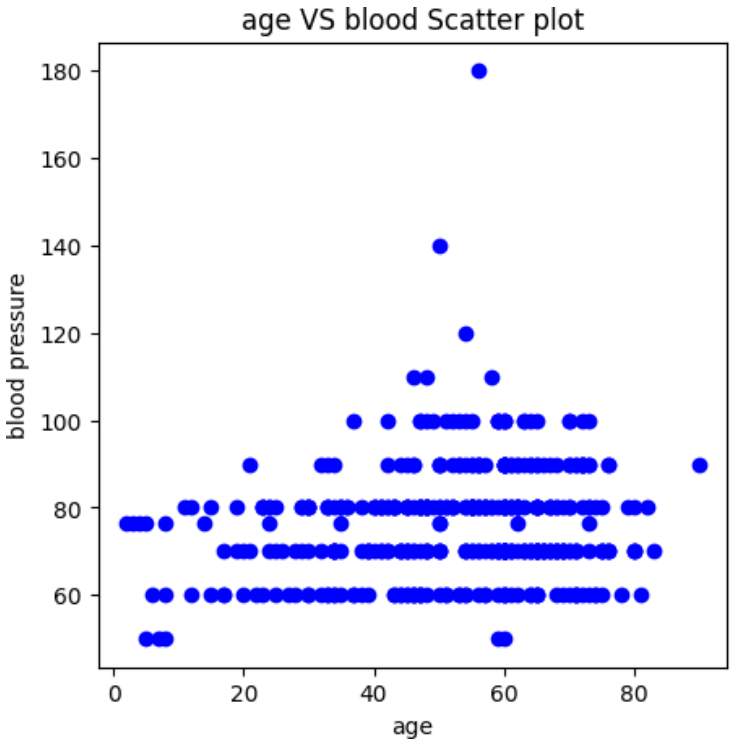


3. Result

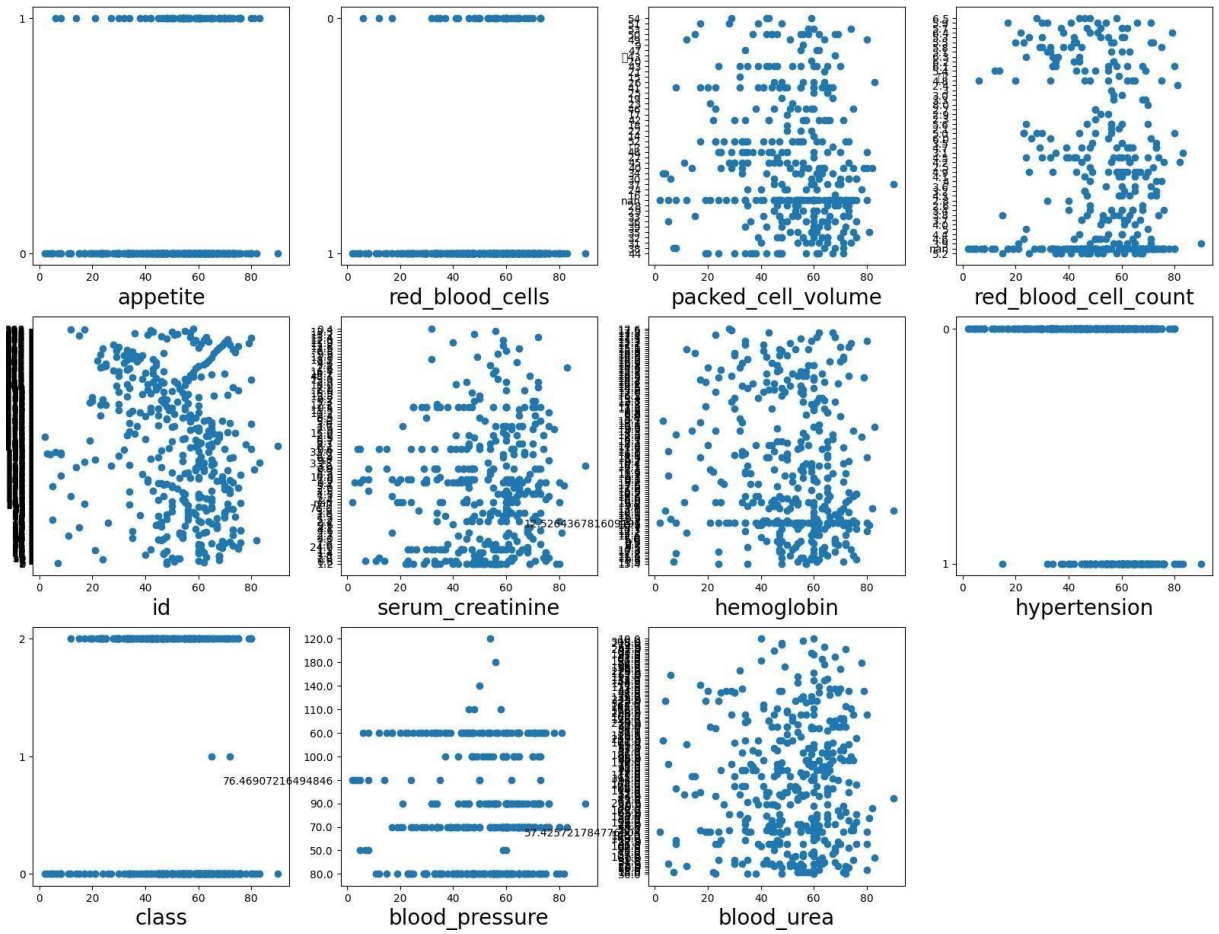
3.1 Univariateanalysis

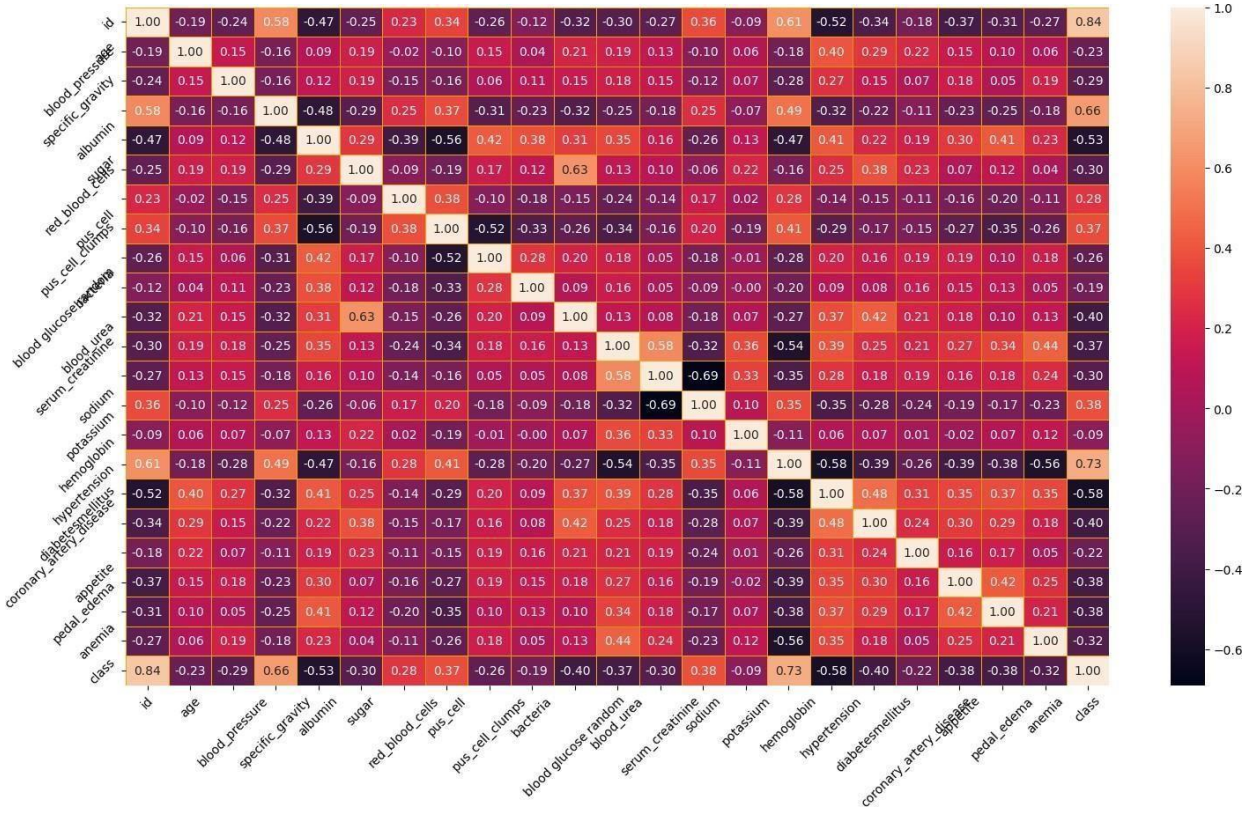


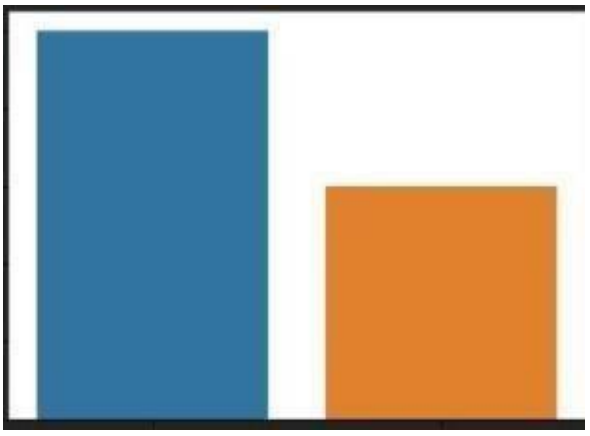
3.2 Bivariateanalysis

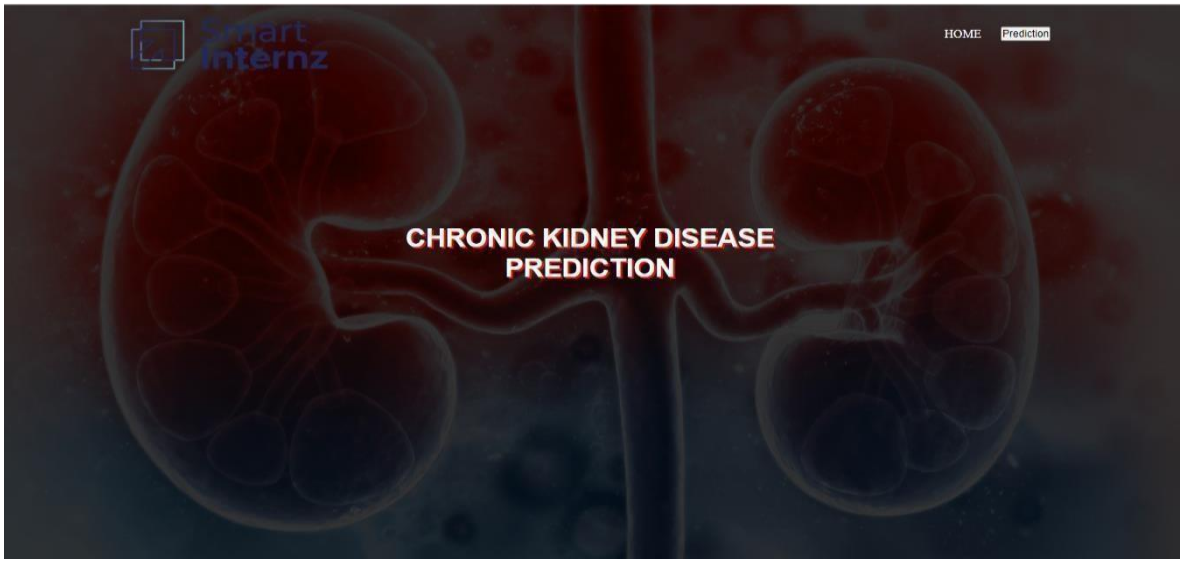


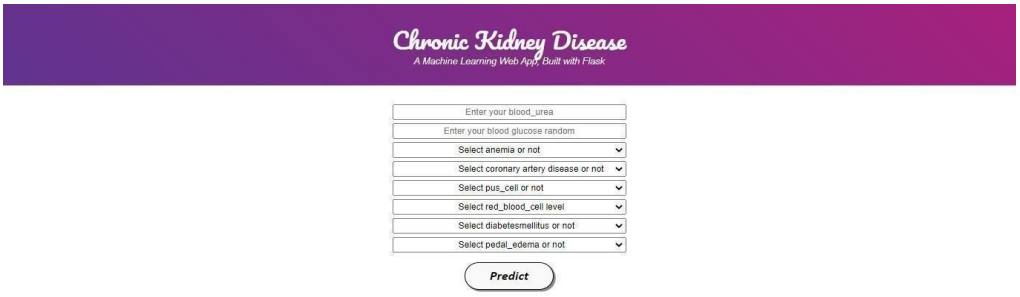
3.3 Multivariateanalysis



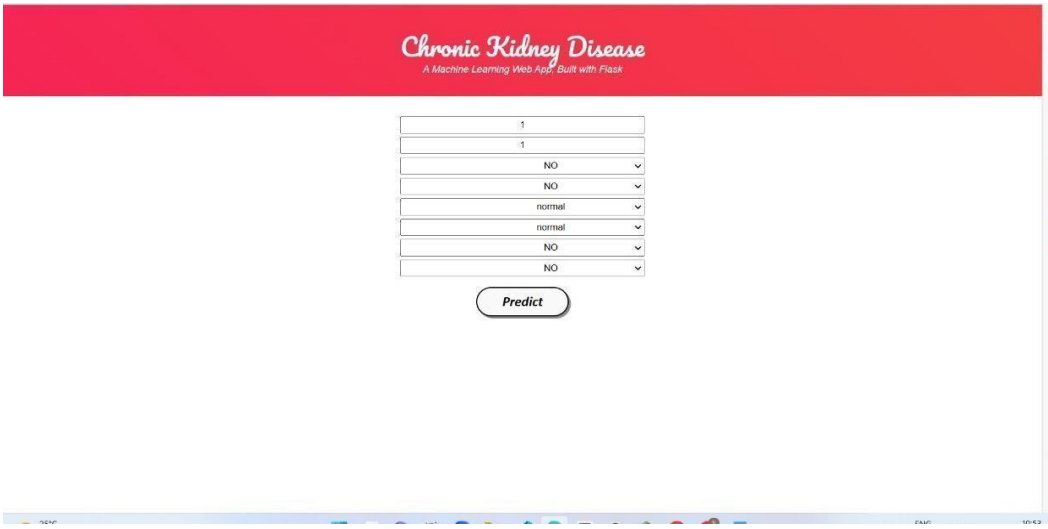

id age blood_pressure specific_gravity albumin sugar red_blood_cells pus_cell pus_cell_clumps bacteria blood glucose random blood_urea serum_creatinine sodium potassium hemoglobin hypertension diabetesmellitus coronary_artery_disease appetite pedal_edema anemia class
1.0 0.8 0.6 0.4 0.2 0.0 −0.2 −0.4 −0.6







Input - Now, the user will give inputs to get the predicted result after clicking onto the submit button.


Chronic Kidney Disease
A Machine Learning Web App, Built with Flask
1
1
NO
NO
normal
normal
NO
NO
Predict


Chronic Kidney Disease
A Machine Learning Web App, Built with Flask
Prediction: Great! You DON'T have Chronic Kidney Disease
IT'S TIME TO PARTYYYYYY !

3. ADVANTAGES&DISADVANTAGES

ADVANTAGES

- EarlydetectionandtreatmentofCKDcanslowdownorstoptheprogressionofthedisease,whichca nhelppreventor delaytheneedfordialysisorakidneytransplant.
- CKDmaybedetectedduringroutinebloodorurinetests,whichcanleadtoearlierdetectionofotherhealthp roblems thatmaybe contributingtothekidneydisease.
- CKDmayleadtochangesinlifestylethat canimproveoverallhealth,suchasfollowingahealthydiet,quittingsmoking,andincreasingphysicalac tivity

DISADVANTAGES

- CKDcanincreasetherisk ofseriushealthproblems,suchasheartdisease,stroke,andbonedisease.
- ThesymptomsofCKD maybevagueandnonspecific,makingitdifficulttodetect untilthediseasehasprogressedtoalaterstage.
- TreatmentforCKDcanbeexpensiveandtime-consuming,requiringregulardoctorvisits,medications,andpotentiallydialysis orakidneytransplant.
- CKDcanhaveasignificantimpactonqualityoflife,includingfatigue,sleepdisturbances,andchangesin appetiteorbodyweight.
- CKDcanalsoleadtofeelingsofanxiety,depression,or stress,especially if itrequiresmajorlifestyle changes orinterfereswithdailyactivities.

4. APPLICATION

Chronickidneydisease(CKD) hasseveralapplicationsinhealthcare,including:

1. Diagnosis: CKD can be diagnosed using blood and urine tests that measure kidney function anddetectany abnormalities.Thesetestscanhelphealthcareprovidersidentifythediseaseearly,allowingforearlyintervention andbetteroutcomes.
2. Monitoring: Once diagnosed, CKD can be monitored over time to track changes in kidney functionand determine the effectiveness of treatment. Monitoring may include regular blood and urine tests,imagingstudies,andotherdiagnostictests.
3. Treatment: CKD can be treated using a variety of approaches,includingmedications,lifestylechanges,anddialysis orkidney transplantin advancedcases.Healthcareprovidersmay use acombinationofthesetreatmentstomanagethediseaseandpreventcomplications.
4. Prevention: Individuals at risk of CKD, such as those with diabetes, high blood pressure, or a familyhistory of kidney disease, may benefit from early detection and intervention to prevent the diseasefromdeveloping.
5. Research: CKD research has led to advancements in understanding the disease, identifying riskfactors,anddevelopingnewtreatments.Ongoingresearchinthisareamayleadtofurtherimprovementsi nCKDdiagnosis,treatment,andprevention.

6. CONCLUSION

Individuals at risk of CKD should be vigilant about monitoring their kidney function and takingsteps to prevent the disease from developing or progressing. Healthcare providers play a critical role indiagnosing,monitoring,andtreatingCKD,andongoingresearchinthisareamayleadtofurtherimprovements in CKD outcomes. Overall, managing CKD requires a comprehensive, multidisciplinaryapproachthatinvolves healthcareproviders,patients,andtheirfamilies.

In conclusion, chronic kidney disease (CKD) is a serious medical condition in which the kidneysgradually lose their ability to function properly over time. While early detection andintervention canslow or stop the progression of the disease, CKD can increase the risk of serious health problems, such asheart disease and bone disease. Treatment for CKD can be expensive and time-consuming, and mayincludemedications,lifestylechanges,andinsomecases,dialysis orakidneytransplant.

7. FUTURESCOPE

Thereareseveralareasoffutureresearchanddevelopmentinchronickidneydisease(CKD)thathavethepotentialtoimprovediagnosis,treatment,andoutcomes.Herearesomeexamples:

1. Early Detection: Researchers are exploring new biomarkers that can detect CKD at an earlier stage,before significant kidney damage has occurred. These biomarkers may include urine and blood tests,imagingstudies,andotherdiagnostictools.
2. Precision Medicine: Advances in genetics and personalized medicine may lead to more targetedtreatmentsforCKDbasedonanindividual'suniquegeneticmakeupandotherfactors.
3. RegenerativeMedicine:Researchers areexploringnewtechniquesforrepairingorregeneratingdamagedkidneytissue,suchas stemcelltherapyandtissueengineering.
4. ArtificialKidneys:Developmentof artificial kidneysthatcan replacethefunction of damagedkidneys,potentiallyreducingthe needfordialysisortransplantation.
5. Telemedicine: Telemedicine and remote monitoring technologies may improve access to care forpatientswithCKD,especiallyinunderserved areas orregionswith limitedaccesstospecialists.
6. Patient Education: Improved patient education and engagement can help individuals with CKD betterunderstand theircondition,manage theirsymptoms,and adhere totreatmentplans.

8.APPENDIX

A.SOURCECODE

```
importpandasaspdimpor
tnumpyasnp
fromcollectionsimportCounterascimpor
t matplotlib.pyplot as
pltimportseabornassns
importmissingnoasmsno
fromsklearn.metricsimportaccuracy_score,confusion_matrixfr
om sklearn.model_selection importtrain_test_split
from sklearn.preprocessing
importLabelEncoderfromsklearn.linear_modelimportLo
gisticRegressionimport
pickledata=pd.read_csv("/content/kidney_disease.cs
v")data.head()

data.columnsdata.columns=['id','age','blood_pressure','specific_gravit

y','albumin',
                                'sugar','red_blood_cells','pus_cell','pus
_cell_clumps','bacteria',
                                'bloodglucoserandom','blood_urea','seru
m_creatinine','sodium','potassium',
                                 'hemoglobin','packed_cell_volume','white
_blood_cell_count','red_blood_cell_count',
                                 'hypertension','diabetesmellitus','coron
ary_artery_disease','appetite',
                                 'pedal_edema','anemia','class']
data.columns

data.info()data.is

null().any()

data['bloodglucoserandom'].fillna(data['bloodglucoserandom'].mean()
,inplace=True)data['blood_pressure'].fillna(data['blood_pressure'].mea
n(),inplace=True)
data['blood_urea'].fillna(data['blood_urea'].mean(),inplace=True)data[
'hemoglobin'].fillna(data['hemoglobin'].mean(),inplace=True)data['pack
ed_cell_volume'].fillna(data['packed_cell_volume'].mean(),inplace=True)
data['potassium'].fillna(data['potassium'].mean(),inplace=True)data['r
ed_blood_cell_count'].fillna(data['red_blood_cell_count'].mean()
,inplace=True)
```

```
data['serum_creatinine'].fillna(data['blood_urea'].mean(),inplace=True)
data['sodium'].fillna(data['sodium'].mean(),inplace=True)data['white_b
lood_cell_count'].fillna(data['white_blood_cell_count'].mean(),inplace
=True)


data['age'].fillna(data['age'].mode()[0],inplace=True)data['hypertensi
on'].fillna(data['hypertension'].mode()[0],inplace=True
)
data['pus_cell_clumps'].fillna(data['pus_cell_clumps'].mode()[0],inplac
e=True)data['appetite'].fillna(data['appetite'].mode()[0],inplace=True
)data['albumin'].fillna(data['albumin'].mode()[0],inplace=True)data['p
us_cell'].fillna(data['pus_cell'].mode()[0],inplace=True)data['red_blo
od_cells'].fillna(data['red_blood_cells'].mode()[0],inplace=True)
data['coronary_artery_disease'].fillna(data['coronary_artery_disease']
.mode()[0],inplace=True)data['bacteria'].fillna(data['bacteria'].mode()[0],inp
lace=True)data['anemia'].fillna(data['anemia'].mode()[0],inplace=True)data['su
gar'].fillna(data['sugar'].mode()[0],inplace=True)data['diabetesmellitus'].fil
lna(data['diabetesmellitus'].mode()[0],inplace=True)data['pedal_edema'].fillna
(data['pedal_edema'].mode()[0],inplace=True)data['specific_gravity'].fillna(da
ta['specific_gravity'].mode()[0],inplace=True)


data.isnull().sum()

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

foriincatcols:
      print("Columns:",i)
      print(c(data[i]))
      print('*'*120+'\n')

catcols.remove('red_blood_cell_count')c
atcols.remove('packed_cell_volume')catc
ols.remove('white_blood_cell_count')prin
t(catcols)

catcols=['anemia','pedal_edema','appetite','bacteria','class','coronary
_artery_disease','diabetesmellit'hypertension','pus_cell','pu
s_cell_clumps','red_blood_cells']

fromsklearn.preprocessingimportLabelEncoderfo
riincatcols:
```

```
        print("LABELENCODINGOF:",i)
        LEi=LabelEncoder()print(c(data
        [i]))
        data[i]=LEi.fit_transform(data[i])p
        rint(c(data[i]))
        print("*"*100)

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

foriincontcols:
      print("ContinousColumns:",i)pri
      nt(c(data[i]))
      print('*'*120+'\n')

contcols.remove('specific_gravity')
contcols.remove('albumin')contcols
.remove('sugar')print(contcols)

contcols.add('red_blood_cell_count')c
ontcols.add('packed_cell_volume')cont
cols.add('white_blood_cell_count')prin
t(contcols)

contcols.add('specific_gravity')
contcols.add('albumin')contcols
.add('sugar')print(contcols)

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

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

data.describe()sns.di
stplot(data.age)
import matplotlib.pyplot as
pltfig=plt.figure(figsize=(5,5))plt.scatter(data['age'],dat
a['blood_pressure'],color='blue')plt.xlabel('age')
plt.ylabel('blood
pressure')plt.title("agevsbloodscatte
rplot")
plt.figure(figsize=(20,15),
facecolor='white')plotnumber=1
```

```
forcolumnincontcols:if
     plotnumber<=11:
          ax =
          plt.subplot(3,4,plotnumber)plt.scatt
          er(data['age'],data[column])plt.xlabe
          l(column,fontsize=20)

     plotnumber+=1
plt.show( )
plt.figure(figsize=(20,15),
facecolor='white')plotnumber=1
forcolumnincontcols:if
     plotnumber<=11:
          ax =
          plt.subplot(3,4,plotnumber)plt.scatt
          er(data['age'],data[column])plt.xlabe
          l(column,fontsize=20)

     plotnumber+=1
plt.show( )
f,ax=plt.subplots(figsize=(18,10))sns.heatmap(data.corr(),annot=True,f
mt=".2f",ax=ax,linewidths=0.5,linecolor="orange")
plt.xticks(rotation=45)plt.
yticks(rotation=45)plt.show
()sns.countplot(data['class'
])
fromsklearn.preprocessingimportStandardScalersc
=StandardScaler()
x_bal=sc.fit_transform(x)
selcols=['red_blood_cells','pus_cell','bloodgluroserandom','blood_urea','
pedal_edema','anemia','diabetesmellitus','coronary_artery_disease']x=pd.Da
taFrame(data,columns=selcols)y=pd.DataFrame(data,columns=['class'])
print(x.shape)
print(y.shape)
from sklearn.model_selection import
train_test_splitx_train,x_test,y_train,y_test=train_test_split(x,y,tes
t_size=0.2,random
_state=2)
```