Heart disease detection project

P122 - Group 4

Harshada More

Names of group members:

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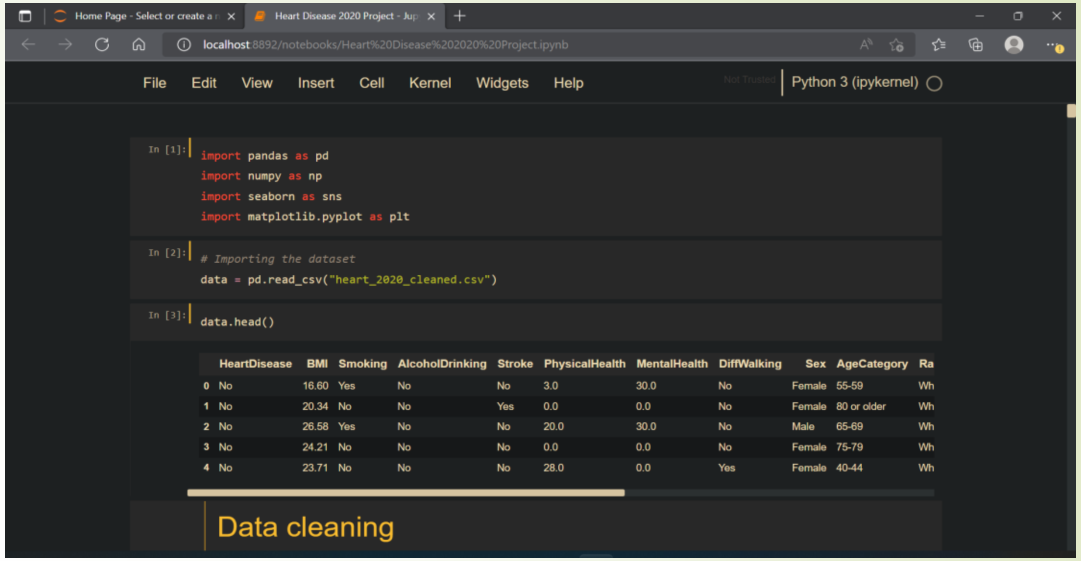
Importing dataset

Data cleaning

EDA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Python 3 (ipykernel)

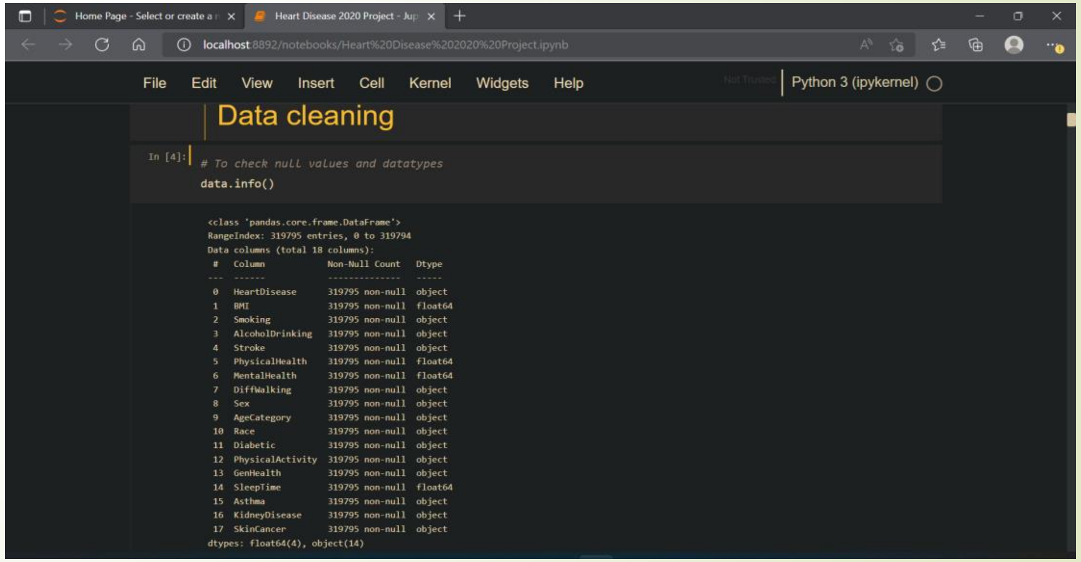
```
In [1]: import pandas as pd
        import numpy as np
        import seaborn as sns
        import matplotlib.pyplot as plt

In [2]: # Importing the dataset
        data = pd.read_csv("heart_2020_cleaned.csv")

In [3]: data.head()
```

	HeartDisease	BMI	Smoking	AlcoholDrinking	Stroke	PhysicalHealth	MentalHealth	DiffWalking	Sex	AgeCategory	Ra
0	No	16.60	Yes	No	No	3.0	30.0	No	Female	55-59	Wh
1	No	20.34	No	No	Yes	0.0	0.0	No	Female	80 or older	Wh
2	No	26.58	Yes	No	No	20.0	30.0	No	Male	65-69	Wh
3	No	24.21	No	No	No	0.0	0.0	No	Female	75-79	Wh
4	No	23.71	No	No	No	28.0	0.0	Yes	Female	40-44	Wh

Data cleaning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Data cleaning

```
In [4]: # To check null values and datatypes
        data.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 319795 entries, 0 to 319794
Data columns (total 18 columns):
 #   Column            Non-Null Count   Dtype  
---  ------            --------------   -----  
 0   HeartDisease      319795 non-null  object 
 1   BMI               319795 non-null  float64
 2   Smoking           319795 non-null  object 
 3   AlcoholDrinking   319795 non-null  object 
 4   Stroke            319795 non-null  object 
 5   PhysicalHealth    319795 non-null  float64
 6   MentalHealth      319795 non-null  float64
 7   DiffWalking       319795 non-null  object 
 8   Sex               319795 non-null  object 
 9   AgeCategory       319795 non-null  object 
 10  Race              319795 non-null  object 
 11  Diabetic          319795 non-null  object 
 12  PhysicalActivity  319795 non-null  object 
 13  GenHealth         319795 non-null  object 
 14  SleepTime         319795 non-null  float64
 15  Asthma            319795 non-null  object 
 16  KidneyDisease     319795 non-null  object 
 17  SkinCancer        319795 non-null  object 
dtypes: float64(4), object(14)
```

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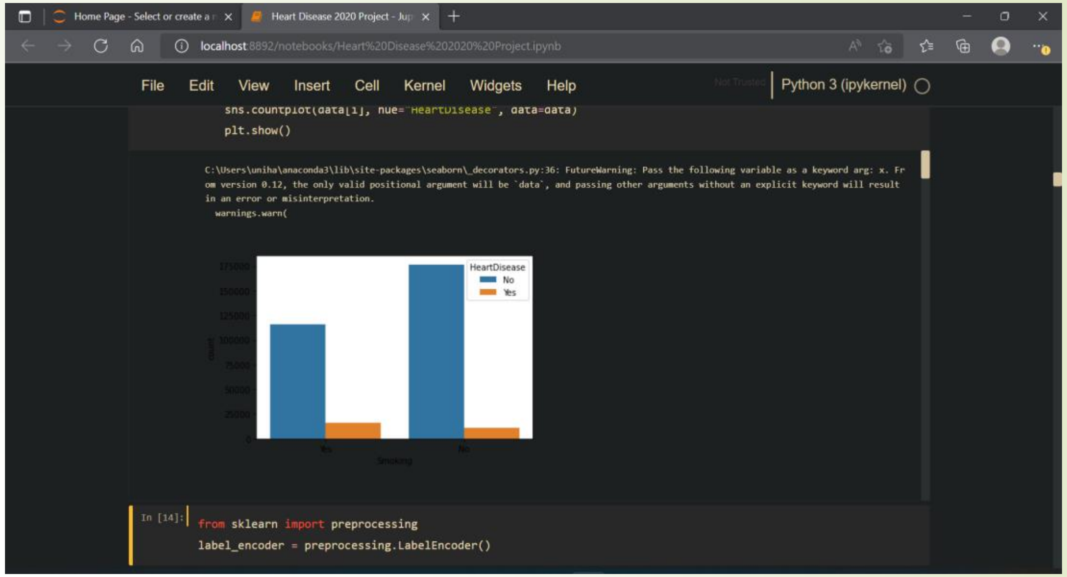
Visualisation

Label encoder

Defining variables

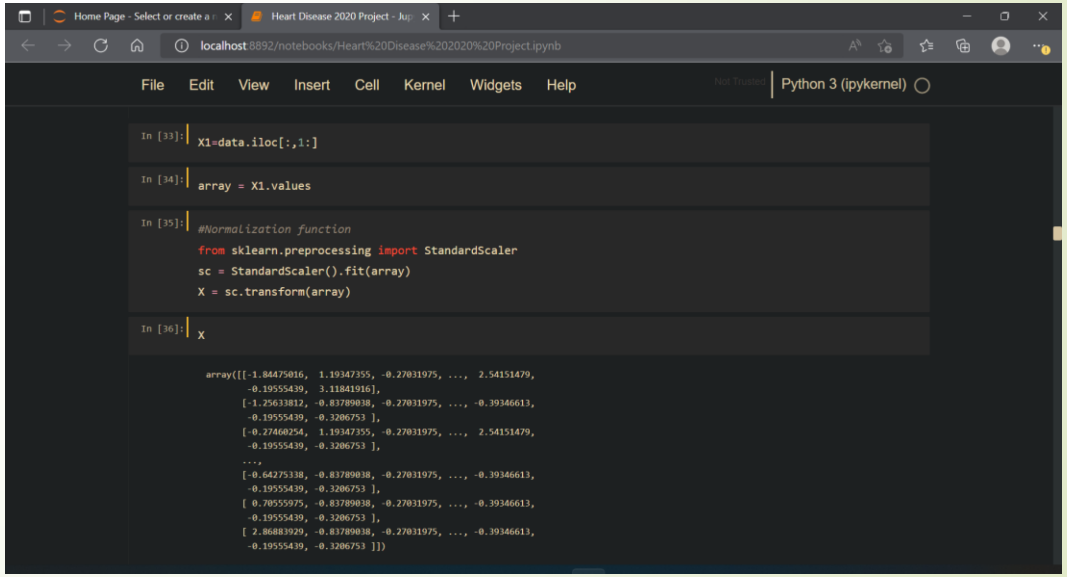
Train-Test split data



```
sns.countplot(data[i], hue="HeartDisease", data=data)
plt.show()
```

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

```
In [14]: from sklearn import preprocessing
         label_encoder = preprocessing.LabelEncoder()
```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```
In [33]: X1=data.iloc[:,1:]

In [34]: array = X1.values

In [35]: #Normalization function
         from sklearn.preprocessing import StandardScaler
         sc = StandardScaler().fit(array)
         X = sc.transform(array)

In [36]: X
```

```
array([[-1.84475016,  1.19347355, -0.27031975, ...,  2.54151479,
        -0.19555439,  3.11841916],
       [-1.25633812, -0.83789038, -0.27031975, ..., -0.39346613,
        -0.19555439, -0.3206753 ],
       [-0.27460254,  1.19347355, -0.27031975, ...,  2.54151479,
        -0.19555439, -0.3206753 ],
       ...,
       [-0.64275338, -0.83789038, -0.27031975, ..., -0.39346613,
        -0.19555439, -0.3206753 ],
       [ 0.70555975, -0.83789038, -0.27031975, ..., -0.39346613,
        -0.19555439, -0.3206753 ],
       [ 2.86883929, -0.83789038, -0.27031975, ..., -0.39346613,
        -0.19555439, -0.3206753 ]])
```

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Model analysis performed for the following models:

- Logistic regression
- Decision Tree Classifier
- KNN
- Naïve Bayes
- XGBM
- LGBM
- SVM
- Random forest

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Model analysis performed:

- Confusion matrix
- Model accuracy for training data
- Model accuracy for test data
- Classification report

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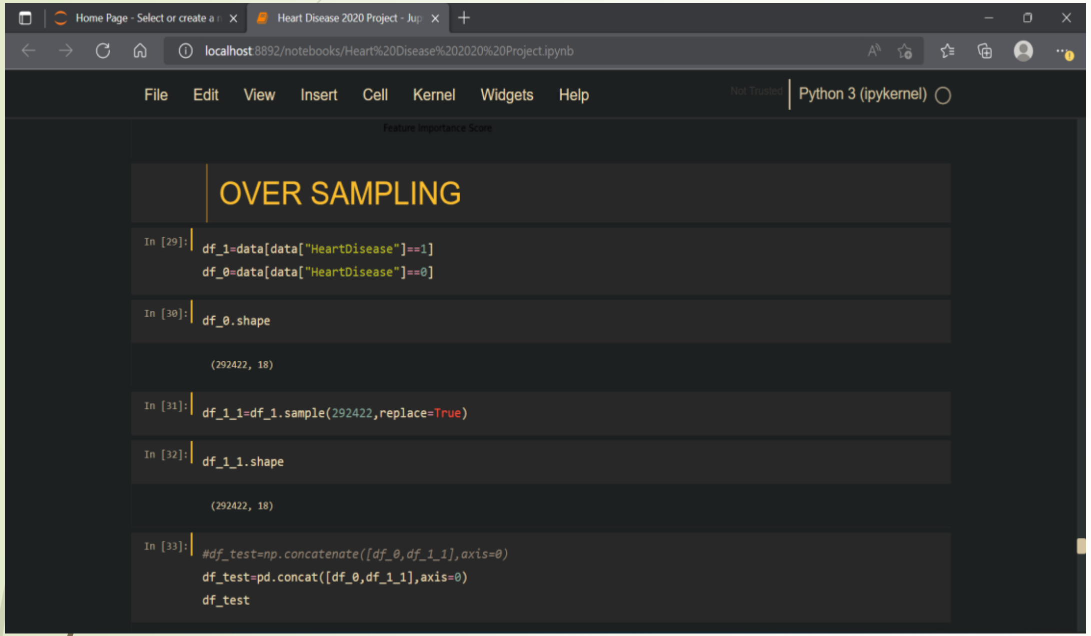
Over sampling model analysis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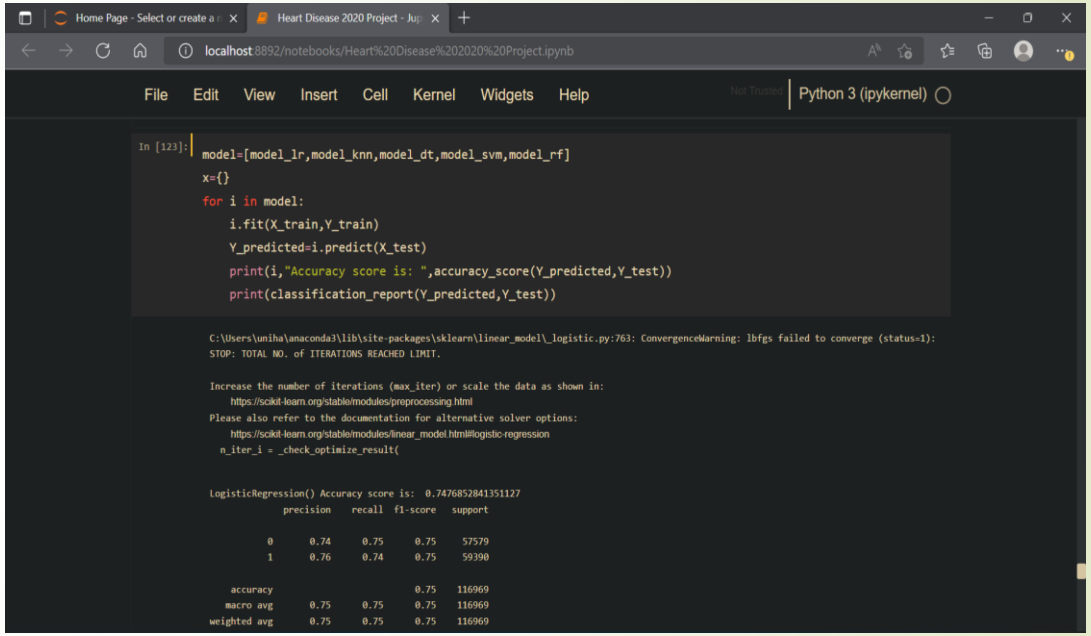
Feature Importance Score

OVER SAMPLING

```
In [29]: df_1=data[data["HeartDisease"]==1]
         df_0=data[data["HeartDisease"]==0]

In [30]: df_0.shape

         (292422, 18)

In [31]: df_1_1=df_1.sample(292422,replace=True)

In [32]: df_1_1.shape

         (292422, 18)

In [33]: #df_test=np.concatenate([df_0,df_1_1],axis=0)
         df_test=pd.concat([df_0,df_1_1],axis=0)
         df_test
```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Python 3 (ipykernel)

```
In [123]: model=[model_lr,model_knn,model_dt,model_svm,model_rf]
          x={}
          for i in model:
              i.fit(X_train,Y_train)
              Y_predicted=i.predict(X_test)
              print(i,"Accuracy score is: ",accuracy_score(Y_predicted,Y_test))
              print(classification_report(Y_predicted,Y_test))

C:\Users\uniha\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:763: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(


LogisticRegression() Accuracy score is:  0.7476852841351127
              precision    recall  f1-score   support

           0       0.74      0.75      0.75     57579
           1       0.76      0.74      0.75     59390

    accuracy                           0.75    116969
   macro avg       0.75      0.75      0.75    116969
weighted avg       0.75      0.75      0.75    116969
```

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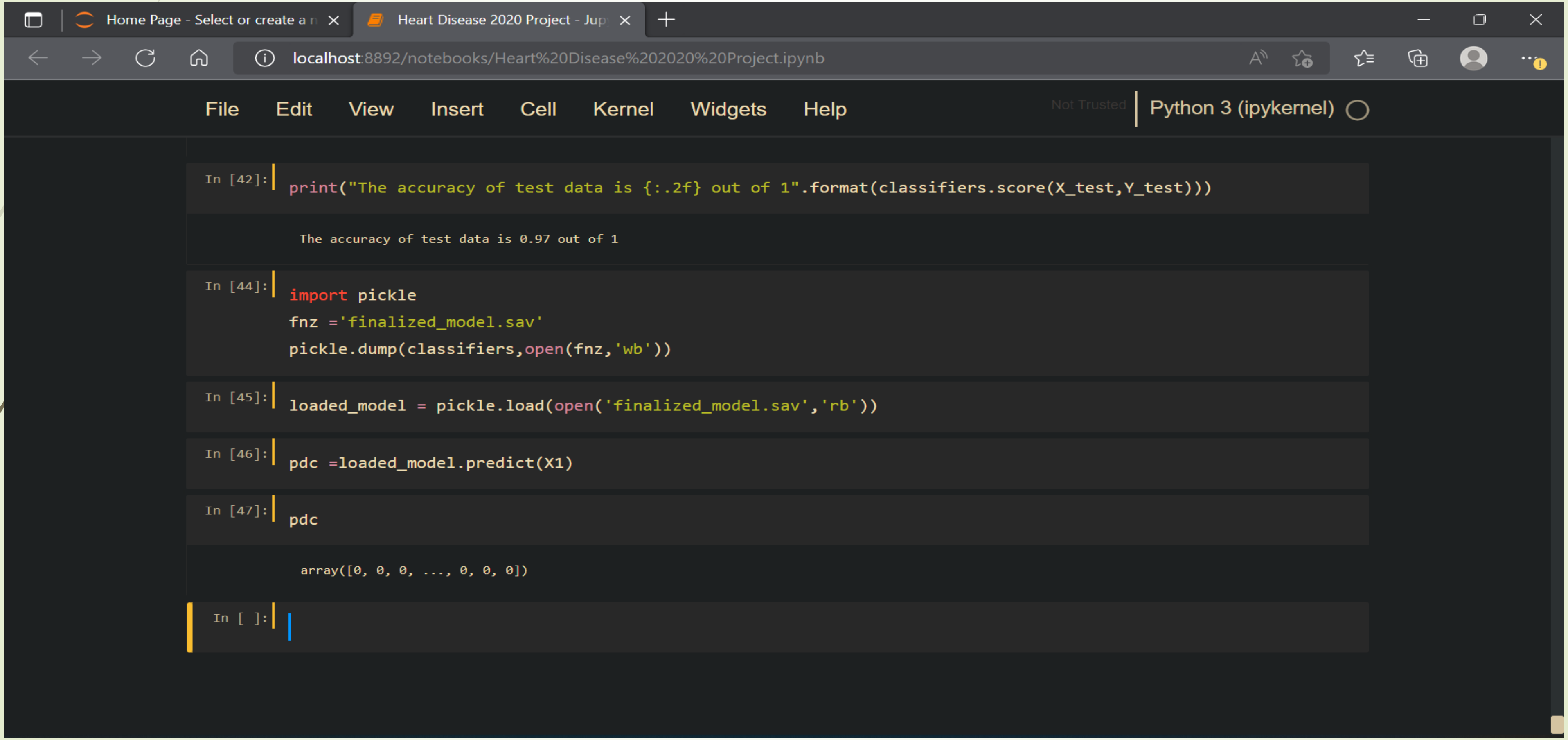
Saving the finalized model – Random forest by using pickle



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```
In [42]: print("The accuracy of test data is {:.2f} out of 1".format(classifiers.score(X_test,Y_test)))

         The accuracy of test data is 0.97 out of 1

In [44]: import pickle
         fnz ='finalized_model.sav'
         pickle.dump(classifiers,open(fnz,'wb'))

In [45]: loaded_model = pickle.load(open('finalized_model.sav','rb'))

In [46]: pdc =loaded_model.predict(X1)

In [47]: pdc

         array([0, 0, 0, ..., 0, 0, 0])

In [ ]:
```

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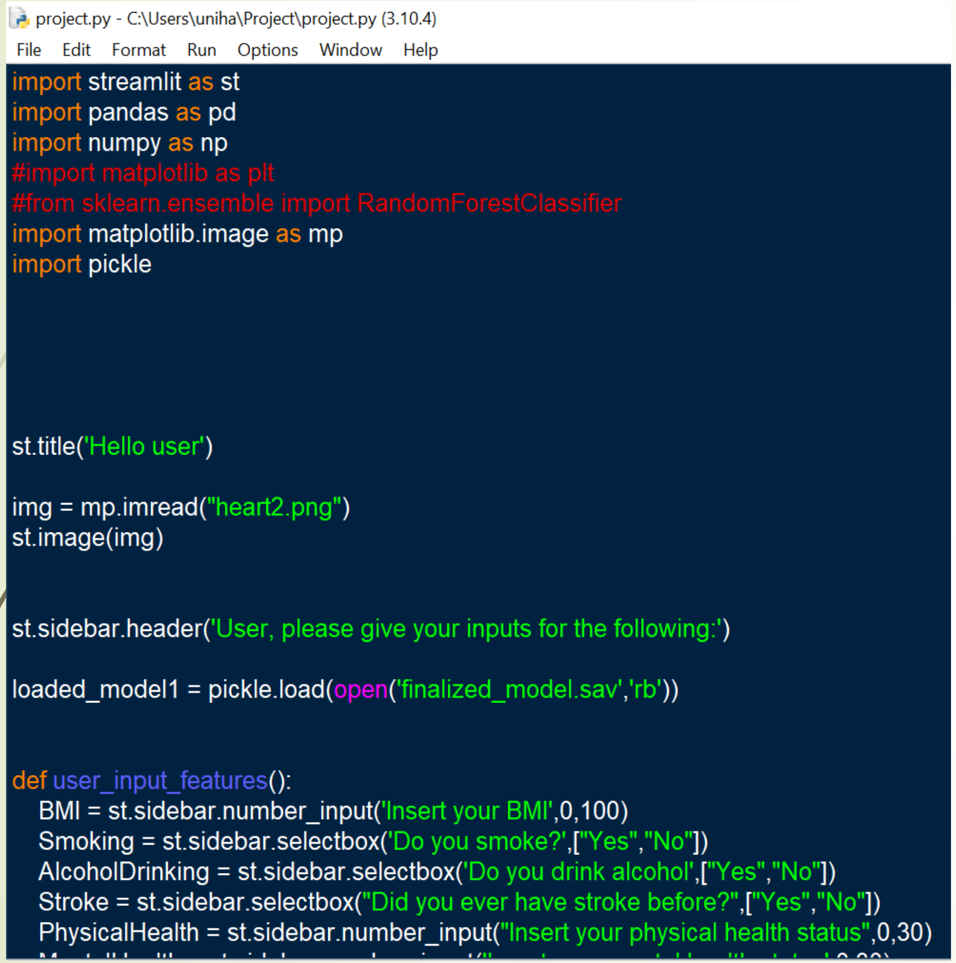
Streamlit code (Part of the code)


project.py - C:\Users\uniha\Project\project.py (3.10.4)
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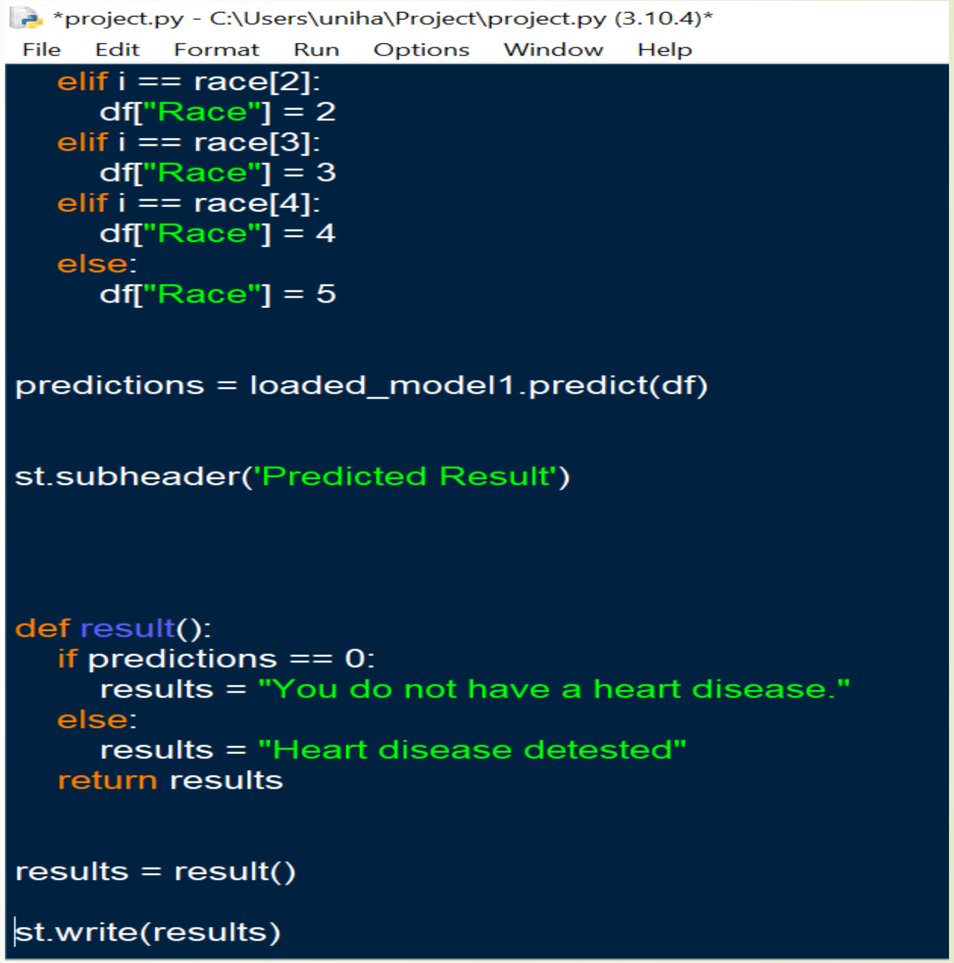
```python
import streamlit as st
import pandas as pd
import numpy as np
#import matplotlib as plt
#from sklearn.ensemble import RandomForestClassifier
import matplotlib.image as mp
import pickle






st.title('Hello user')

img = mp.imread("heart2.png")
st.image(img)


st.sidebar.header('User, please give your inputs for the following:')

loaded_model1 = pickle.load(open('finalized_model.sav','rb'))


def user_input_features():
    BMI = st.sidebar.number_input('Insert your BMI',0,100)
    Smoking = st.sidebar.selectbox('Do you smoke?',["Yes","No"])
    AlcoholDrinking = st.sidebar.selectbox('Do you drink alcohol',["Yes","No"])
    Stroke = st.sidebar.selectbox("Did you ever have stroke before?",["Yes","No"])
    PhysicalHealth = st.sidebar.number_input("Insert your physical health status",0,30)
```


project.py - C:\Users\uniha\Project\project.py (3.10.4)
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```python
    elif i == race[2]:
        df["Race"] = 2
    elif i == race[3]:
        df["Race"] = 3
    elif i == race[4]:
        df["Race"] = 4
    else:
        df["Race"] = 5


predictions = loaded_model1.predict(df)


st.subheader('Predicted Result')




def result():
    if predictions == 0:
        results = "You do not have a heart disease."
    else:
        results = "Heart disease detested"
    return results


results = result()

st.write(results)
```

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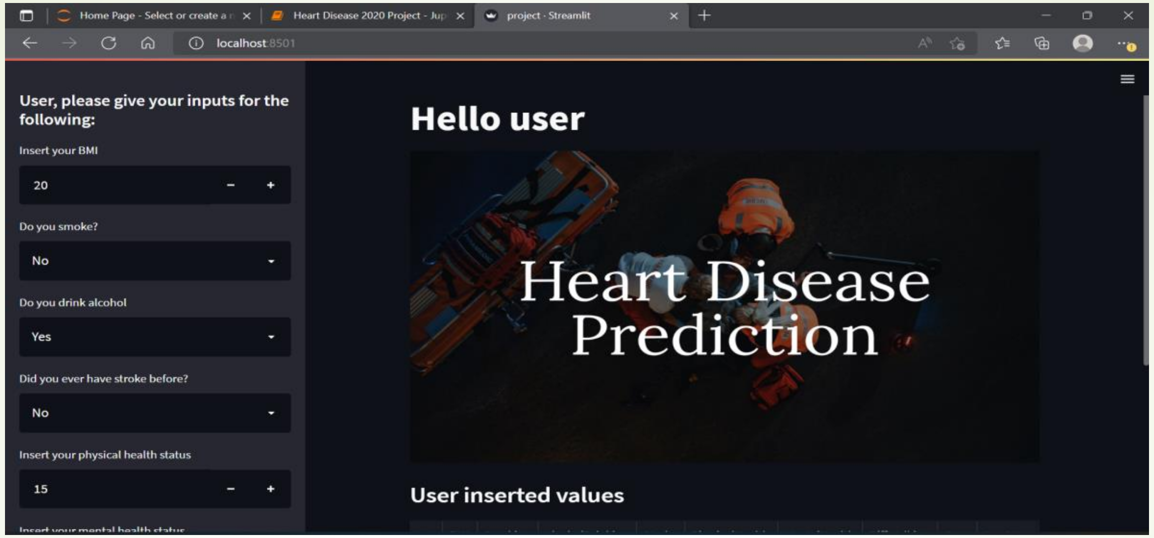
Model final output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project · Streamlit
localhost:8501

User, please give your inputs for the following:

Insert your BMI
20

Do you smoke?
No

Do you drink alcohol
Yes

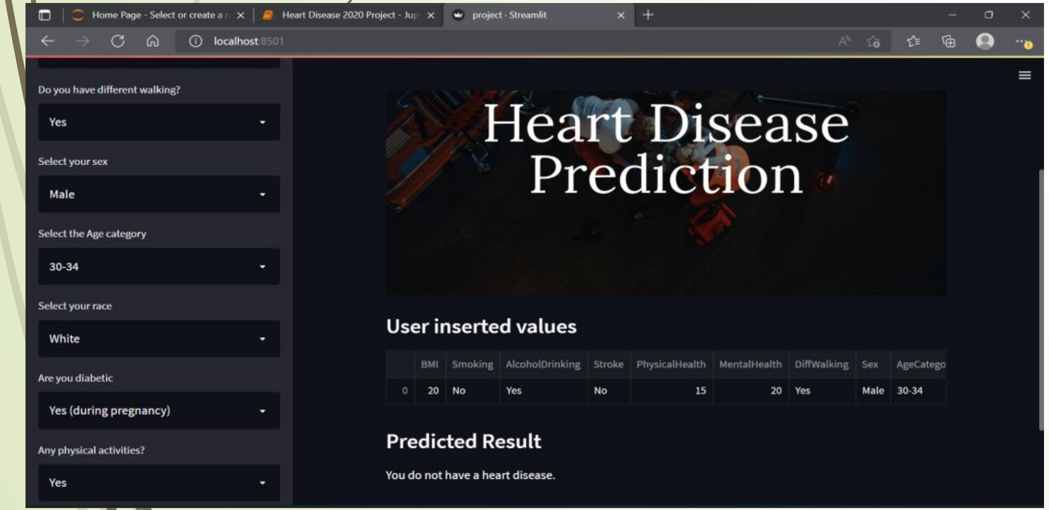
Did you ever have stroke before?
No

Insert your physical health status
15

Insert your mental health status

Hello user

User inserted values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localhost:8501
Heart Disease Prediction

Do you have different walking?
Yes

Select your sex
Male

Select the Age category
30-34

Select your race
White

Are you diabetic
Yes (during pregnancy)

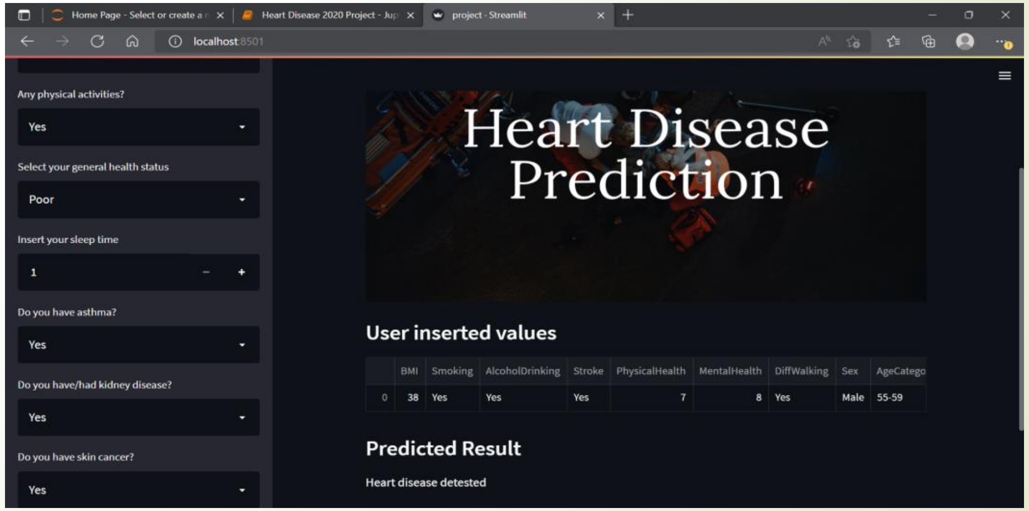
Any physical activities?
Yes

User inserted values

	BMI	Smoking	AlcoholDrinking	Stroke	PhysicalHealth	MentalHealth	DiffWalking	Sex	AgeCatego
0	20	No	Yes	No	15	20	Yes	Male	30-34

Predicted Result

You do not have a heart disease.


Home Page - Select or create a n
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localhost:8501
Heart Disease Prediction

Any physical activities?
Yes

Select your general health status
Poor

Insert your sleep time
1

Do you have asthma?
Yes

Do you have/had kidney disease?
Yes

Do you have skin cancer?
Yes

User inserted values

	BMI	Smoking	AlcoholDrinking	Stroke	PhysicalHealth	MentalHealth	DiffWalking	Sex	AgeCatego
0	38	Yes	Yes	Yes	7	8	Yes	Male	55-59

Predicted Result

Heart disease detested

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