Zeta Disease Prediction

In [1]:
```
# Set the working directory
import os
os.chdir(r'D:\2_p\p\Studies\DS\Car\carriercorporationtakehomechallenge')
```

In [2]:
```
# import the required libraries
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn import metrics
from sklearn.preprocessing import StandardScaler
%matplotlib inline
```

Exploring the Train data

In [3]:
```
# Read the data file
df_train = pd.read_csv(r'2021-01-21_zeta-disease_training-data_dsi-take-home-challenge.csv')
df_train.head()
```

Out[3]:

	age	weight	bmi	blood_pressure	insulin_test	liver_stress_test	cardio_stress_test	years_sm
0	54	189	27.1	80	0	1.5038	0	
1	23	150	38.5	68	71	0.3868	55	
2	47	186	29.9	90	0	0.2728	0	
3	18	150	30.8	70	1033	0.6598	56	
4	24	160	32.4	74	125	0.7608	59	

In [4]:
```
# Let us check the size of the data frame
df_train.shape
```

Out[4]:
```
(800, 9)
```

Train data frame has 8 coloumns (7 are independent variables and 1 dependent variable)

In [5]:
```
# let us print the column names
df_train.columns.values
```

Out[5]:
```
array(['age', 'weight', 'bmi', 'blood_pressure', 'insulin_test',
       'liver_stress_test', 'cardio_stress_test', 'years_smoking',
       'zeta_disease'], dtype=object)
```

In [6]:
```
# print info to check is there any null values
df_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 800 entries, 0 to 799
Data columns (total 9 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   age                 800 non-null    int64  
 1   weight              800 non-null    int64  
 2   bmi                 800 non-null    float64
 3   blood_pressure      800 non-null    int64  
 4   insulin_test        800 non-null    int64  
 5   liver_stress_test   800 non-null    float64
 6   cardio_stress_test  800 non-null    int64  
 7   years_smoking       800 non-null    int64  
 8   zeta_disease        800 non-null    int64  
dtypes: float64(2), int64(7)
memory usage: 56.4 KB
```

In [7]:
```
df_train.isnull().sum()
```

Out[7]:
```
age                   0
weight                0
bmi                   0
blood_pressure        0
insulin_test          0
liver_stress_test     0
cardio_stress_test    0
years_smoking         0
zeta_disease          0
dtype: int64
```

There are no null values

In [8]:
```
# let us check the standard deviation, min and mac values etc.
df_train.describe()
```

Out[8]:

	age	weight	bmi	blood_pressure	insulin_test	liver_stress_test	cardi
count	800.000000	800.000000	800.000000	800.000000	800.000000	800.000000	
mean	30.985000	172.407500	32.201625	69.565000	85.887500	0.544496	
std	13.824025	31.942438	8.549155	19.874784	126.333656	0.348711	
min	18.000000	94.000000	0.000000	0.000000	0.000000	0.140800	
25%	21.000000	149.000000	27.300000	62.000000	0.000000	0.307800	
50%	26.000000	167.000000	32.050000	72.000000	45.000000	0.445300	
75%	38.000000	192.000000	36.525000	80.000000	130.000000	0.699800	
max	109.000000	308.000000	86.100000	157.000000	1077.000000	3.481300	

From the above we notice that the standard devivation of the independent variables varying from 0.348711 liver_stress_test) to 126.333656 (insulin_test).

In [9]:
```
# Let us re-check the unique values dependent variable
df_train.zeta_disease.unique()
```

Out[9]:
```
array([0, 1], dtype=int64)
```

We noticed the there are two unique values only (1 = Yes and 0 = No)

In [10]:
```
# Let us count the unique values
df_train.zeta_disease.value_counts()
```

Out[10]:
```
0    521
1    279
Name: zeta_disease, dtype: int64
```

We can notice that there 521 data points with 'No' and 279 data points with with 'Yes' . This indicates the dataset is imbalanced

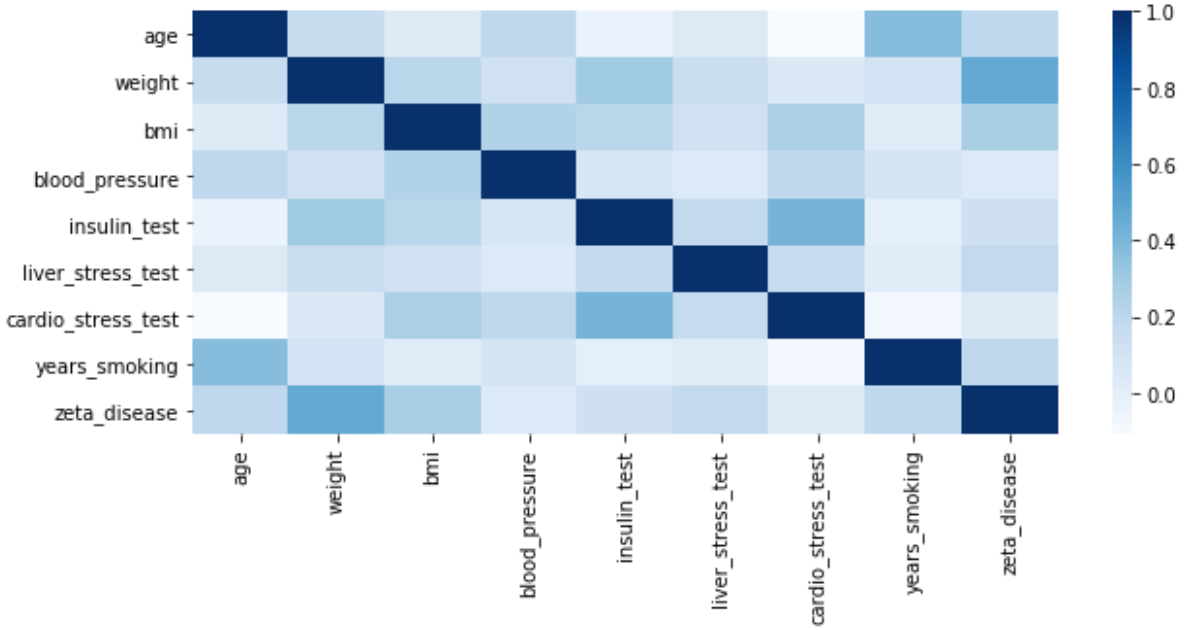
In [11]:
```
corr = df_train.corr()
corr
```

Out[11]:

	age	weight	bmi	blood_pressure	insulin_test	liver_stress_test
age	1.000000	0.157705	0.035347	0.193066	-0.034294	0.042416
weight	0.157705	1.000000	0.214262	0.122349	0.304295	0.146779
bmi	0.035347	0.214262	1.000000	0.240513	0.217265	0.116649
blood_pressure	0.193066	0.122349	0.240513	1.000000	0.079425	0.045764
insulin_test	-0.034294	0.304295	0.217265	0.079425	1.000000	0.175230
liver_stress_test	0.042416	0.146779	0.116649	0.045764	0.175230	1.000000
cardio_stress_test	-0.106039	0.053629	0.264861	0.193221	0.417894	0.172048
years_smoking	0.372373	0.100834	0.028683	0.095613	-0.006292	0.021817
zeta_disease	0.192925	0.471155	0.271856	0.045739	0.126504	0.184738

In [12]:
```
plt.figure(figsize=(10,4))
sns.heatmap(corr, cmap='Blues')
```

Out[12]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x297f14f0630>
```



Read the Test data

In [13]:
```
df_test = pd.read_csv(r'2021-01-21_zeta-disease_prediction-data_dsi-take-home-challenge.csv')
df_test.head()
```

Out[13]:

	age	weight	bmi	blood_pressure	insulin_test	liver_stress_test	cardio_stress_test	years_sm
0	24	151	39.5	69	72	1.3968	56	
1	27	179	35.5	89	156	1.6608	43	
2	34	147	26.9	76	74	1.6958	53	
3	35	206	32.4	73	127	1.4608	61	
4	60	193	29.8	62	192	1.7798	65	

In [14]:
```
df_test.shape
```

Out[14]:
```
(20, 9)
```

In [15]:
```
df_test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20 entries, 0 to 19
Data columns (total 9 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   age                 20 non-null     int64  
 1   weight              20 non-null     int64  
 2   bmi                 20 non-null     float64
 3   blood_pressure      20 non-null     int64  
 4   insulin_test        20 non-null     int64  
 5   liver_stress_test   20 non-null     float64
 6   cardio_stress_test  20 non-null     int64  
 7   years_smoking       20 non-null     int64  
 8   zeta_disease        0 non-null      float64
dtypes: float64(3), int64(6)
memory usage: 1.5 KB
```

In [16]:
```
x_testdata = df_test[['age', 'weight', 'bmi', 'blood_pressure', 'insulin_test', 'liver_stress_test', 'cardio_stress_test', 'years_smoking']]
```

Using Logistic Regression

Build a Logistic Regression Model

In [17]:
```
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report, confusion_matrix
```

In [18]:
```
x = df_train[['age', 'weight', 'bmi', 'blood_pressure', 'insulin_test', 'liver
_stress_test', 'cardio_stress_test', 'years_smoking']]
y = df_train['zeta_disease']
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.25,random_sta
te=27)
logistic_regression= LogisticRegression(max_iter=10000)
logistic_regression.fit(x_train,y_train)
y_pred=logistic_regression.predict(x_test)
```

In [19]:
```
# compute the confusion matrix
confusion_matrix = pd.crosstab(y_test, y_pred, rownames=['Actual'], colnames=[
'Predicted'])
confusion_matrix
```

Out[19]:

Predicted	0	1
Actual		
0	115	9
1	36	40

In [20]:
```
# calculate the accuracy
print('Accuracy: ',metrics.accuracy_score(y_test, y_pred))
plt.show()
```

```
Accuracy:  0.775
```

The accuracy with the Logistic regression is around 77.5%

Now, we train with the entire model

In [21]:
```
x = df_train[['age', 'weight', 'bmi', 'blood_pressure', 'insulin_test', 'liver
_stress_test', 'cardio_stress_test', 'years_smoking']]
y = df_train['zeta_disease']
logistic_regression= LogisticRegression(max_iter=10000)
logistic_regression.fit(x,y);
```

Let us do the prediction using test data

In [22]:
```
y_pred=logistic_regression.predict(x_testdata)
y_pred
```

Out[22]:
```
array([0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1],
      dtype=int64)
```

In [ ]:

Random Forest Classifier

In [23]:
```
from sklearn.ensemble import RandomForestClassifier
rfClassifier=RandomForestClassifier(random_state = 27)
rfClassifier.fit(x_train,y_train)
y_pred=rfClassifier.predict(x_test)
```

In [24]:
```
# compute the confusion matrix
confusion_matrix = pd.crosstab(y_test, y_pred, rownames=['Actual'], colnames=[
'Predicted'])
confusion_matrix
```

Out[24]:

Predicted	0	1
Actual		
0	110	14
1	32	44

In [25]:
```
# calculate the accuracy
print('Accuracy: ',metrics.accuracy_score(y_test, y_pred))
plt.show()
```

```
Accuracy:  0.77
```

The accuracy with the Logistic regression is around 77%

Now we will train with the entire model

In [26]:
```
x = df_train[['age', 'weight', 'bmi', 'blood_pressure', 'insulin_test', 'liver
_stress_test', 'cardio_stress_test', 'years_smoking']]
y = df_train['zeta_disease']
rfClassifier = RandomForestClassifier(random_state = 27)
rfClassifier.fit(x,y);
```

Let us do the prediction using test data

In [27]:
```
y_pred=rfClassifier.predict(x_testdata)
y_pred
```

Out[27]:
```
array([0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1],
      dtype=int64)
```

In [ ]:
```

```

Classification accuracy with Logistic regression and Random Forest classifier is around 77%

In [ ]:
```

```