In [1]:
```
# Experiment No:10
```

In [2]:
```
# Aim: Logistic Regression
```

In [3]:
```
# Name: Shravani Narendra Mahalle
```

In [4]:
```
# Class: 3rd year(B)
```

In [5]:
```
# Roll No: 17
```

In [35]:
```
# Date: 5/10/24
```

In [7]:
```
import pandas as pd
```

In [8]:
```
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
from sklearn.model_selection import train_test_split
import warnings
warnings.filterwarnings('ignore')
```

In [9]:
```
import os
```

In [10]:
```
os.getcwd()
```

Out[10]:
```
'C:\\Users\\hp'
```

In [11]:
```
os.chdir("C:\\Users\\hp\\OneDrive\\Desktop")
```

In [12]:
```
df=pd.read_csv("framingham.csv")
```

In [13]:
```
df.head()
```

Out[13]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	diabetes	totChol	sysBP	diaBP	
0	1	39	4.0	0	0.0	0.0	0	0	0	195.0	106.0	70.0	26
1	0	46	2.0	0	0.0	0.0	0	0	0	250.0	121.0	81.0	28
2	1	48	1.0	1	20.0	0.0	0	0	0	245.0	127.5	80.0	25
3	0	61	3.0	1	30.0	0.0	0	1	0	225.0	150.0	95.0	28
4	0	46	3.0	1	23.0	0.0	0	0	0	285.0	130.0	84.0	23

In [14]:
```
df.tail()
```

Out[14]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	diabetes	totChol	sysBP	diaBP
4233	1	50	1.0	1	1.0	0.0	0	1	0	313.0	179.0	92.0
4234	1	51	3.0	1	43.0	0.0	0	0	0	207.0	126.5	80.0
4235	0	48	2.0	1	20.0	NaN	0	0	0	248.0	131.0	72.0
4236	0	44	1.0	1	15.0	0.0	0	0	0	210.0	126.5	87.0
4237	0	52	2.0	0	0.0	0.0	0	0	0	269.0	133.5	83.0

In [15]:
```
df.describe()
```

Out[15]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	diabete
count	4238.000000	4238.000000	4133.000000	4238.000000	4209.000000	4185.000000	4238.000000	4238.000000	4238.00000
mean	0.429212	49.584946	1.978950	0.494101	9.003089	0.029630	0.005899	0.310524	0.02572
std	0.495022	8.572160	1.019791	0.500024	11.920094	0.169584	0.076587	0.462763	0.15831
min	0.000000	32.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
25%	0.000000	42.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
50%	0.000000	49.000000	2.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00000
75%	1.000000	56.000000	3.000000	1.000000	20.000000	0.000000	0.000000	1.000000	0.00000
max	1.000000	70.000000	4.000000	1.000000	70.000000	1.000000	1.000000	1.000000	1.00000

In [16]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4238 entries, 0 to 4237
Data columns (total 16 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   male             4238 non-null   int64  
 1   age              4238 non-null   int64  
 2   education        4133 non-null   float64
 3   currentSmoker    4238 non-null   int64  
 4   cigsPerDay       4209 non-null   float64
 5   BPMeds           4185 non-null   float64
 6   prevalentStroke  4238 non-null   int64  
 7   prevalentHyp     4238 non-null   int64  
 8   diabetes         4238 non-null   int64  
 9   totChol          4188 non-null   float64
 10  sysBP            4238 non-null   float64
 11  diaBP            4238 non-null   float64
 12  BMI              4219 non-null   float64
 13  heartRate        4237 non-null   float64
 14  glucose          3850 non-null   float64
 15  TenYearCHD       4238 non-null   int64  
dtypes: float64(9), int64(7)
memory usage: 529.9 KB
```

In [17]:
```
df.isna().sum()
```

Out[17]:
```
male                0
age                 0
education         105
currentSmoker       0
cigsPerDay         29
BPMeds             53
prevalentStroke     0
prevalentHyp        0
diabetes            0
totChol            50
sysBP               0
diaBP               0
BMI                19
heartRate           1
glucose           388
TenYearCHD          0
dtype: int64
```

In [18]:
```
df
```

Out[18]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	diabetes	totChol	sysBP	diaBP
0	1	39	4.0	0	0.0	0.0	0	0	0	195.0	106.0	70.0
1	0	46	2.0	0	0.0	0.0	0	0	0	250.0	121.0	81.0
2	1	48	1.0	1	20.0	0.0	0	0	0	245.0	127.5	80.0
3	0	61	3.0	1	30.0	0.0	0	1	0	225.0	150.0	95.0
4	0	46	3.0	1	23.0	0.0	0	0	0	285.0	130.0	84.0
...	...	...	...	...	...	...	...	...	...	...	...	...
4233	1	50	1.0	1	1.0	0.0	0	1	0	313.0	179.0	92.0
4234	1	51	3.0	1	43.0	0.0	0	0	0	207.0	126.5	80.0
4235	0	48	2.0	1	20.0	NaN	0	0	0	248.0	131.0	72.0
4236	0	44	1.0	1	15.0	0.0	0	0	0	210.0	126.5	87.0
4237	0	52	2.0	0	0.0	0.0	0	0	0	269.0	133.5	83.0

4238 rows × 16 columns

Missing Value Treatment

In [19]:
```
df['glucose'].fillna(value = df['glucose'].mean(),inplace=True)
```

In [20]:
```
df['education'].fillna(value = df['education'].mean(),inplace=True)
```

In [22]:
```
df['heartRate'].fillna(value = df['heartRate'].mean(),inplace=True)
```

In [23]:
```
df['BMI'].fillna(value = df['BMI'].mean(),inplace=True)
```

In [24]:
```
df['cigsPerDay'].fillna(value = df['cigsPerDay'].mean(),inplace=True)
```

In [25]:
```
df['totChol'].fillna(value = df['totChol'].mean(),inplace=True)
```

In [26]:
```
df['BPMeds'].fillna(value = df['totChol'].mean(),inplace=True)
```

In [27]:
```
df.isna().sum()
```

Out[27]:
```
male               0
age                0
education          0
currentSmoker      0
cigsPerDay         0
BPMeds             0
prevalentStroke    0
prevalentHyp       0
diabetes           0
totChol            0
sysBP              0
diaBP              0
BMI                0
heartRate          0
glucose            0
TenYearCHD         0
dtype: int64
```

In [28]:
```
#Splitting the dependent and independent variables.
x=df.drop("TenYearCHD",axis=1)
y=df['TenYearCHD']
```

In [29]:
```
x
```

Out[29]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	diabetes	totChol	sysBP	dial
0	1	39	4.0	0	0.0	0.000000	0	0	0	195.0	106.0	7(
1	0	46	2.0	0	0.0	0.000000	0	0	0	250.0	121.0	8
2	1	48	1.0	1	20.0	0.000000	0	0	0	245.0	127.5	8(
3	0	61	3.0	1	30.0	0.000000	0	1	0	225.0	150.0	9
4	0	46	3.0	1	23.0	0.000000	0	0	0	285.0	130.0	8
...	...	...	...	...	...	...	...	...	...	...	...	
4233	1	50	1.0	1	1.0	0.000000	0	1	0	313.0	179.0	9
4234	1	51	3.0	1	43.0	0.000000	0	0	0	207.0	126.5	8(
4235	0	48	2.0	1	20.0	236.721585	0	0	0	248.0	131.0	7
4236	0	44	1.0	1	15.0	0.000000	0	0	0	210.0	126.5	8
4237	0	52	2.0	0	0.0	0.000000	0	0	0	269.0	133.5	8

4238 rows × 15 columns

Train Test Split

In [31]:
```
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.2,random_state=42)
```

In [32]:
```
y_train
```

Out[32]:
```
3252    0
3946    0
1261    0
2536    0
4089    0
       ..
3444    0
466     0
3092    0
3772    0
860     0
Name: TenYearCHD, Length: 3390, dtype: int64
```

Logistic Regression Algorithm

In [33]:
```
from sklearn.linear_model import LogisticRegression
model = LogisticRegression().fit(x_train,y_train)
model.score(x_train, y_train)
```

Out[33]: 0.848377581120944