In [17]:

```
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#Roll no : 41
#Section : 3A
#Date : 05/10/2024
```

In [18]:

```
#Aim : To perform operation on support vector machine(SVM Classifier)
```

In [20]:

```
import pandas as pd
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 [21]:

```
import os
```

In [22]:

```
os.getcwd()
```

Out[22]:

```
'C:\\Users\\HP\\Desktop'
```

In [23]:

```
os.chdir("C:\\Users\\HP\\Desktop")
```

In [24]:

```
df=pd.read_csv("framingham.csv")
```

In [25]:

```
 #The "Framingham" heart disease dataset includes over 4,240 records, 15 attri
#The goal of the dataset is to predict whether the patient has 10-year risk of
```

In [26]:

```
df.head()
```

Out[26]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	diab
0	1	39	4.0	0	0.0	0.0	0	0	
1	0	46	2.0	0	0.0	0.0	0	0	
2	1	48	1.0	1	20.0	0.0	0	0	
3	0	61	3.0	1	30.0	0.0	0	1	
4	0	46	3.0	1	23.0	0.0	0	0	

In [27]:

```
df.describe()
```

Out[27]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentS
count	4238.000000	4238.000000	4133.000000	4238.000000	4209.000000	4185.000000	4238.0
mean	0.429212	49.584946	1.978950	0.494101	9.003089	0.029630	0.0
std	0.495022	8.572160	1.019791	0.500024	11.920094	0.169584	0.0
min	0.000000	32.000000	1.000000	0.000000	0.000000	0.000000	0.0
25%	0.000000	42.000000	1.000000	0.000000	0.000000	0.000000	0.0
50%	0.000000	49.000000	2.000000	0.000000	0.000000	0.000000	0.0
75%	1.000000	56.000000	3.000000	1.000000	20.000000	0.000000	0.0

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentS
max	1.000000	70.000000	4.000000	1.000000	70.000000	1.000000	1.0

In [28]:
```
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
```

Checking for discrepancy in data

In [29]:
```
df.isna().sum()
```

Out[29]:
```
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 [30]:
```
#Since, only a few rows have null values in them, we are only removing those
#df = df.dropna(subset=['heartRate','BMI','cigsPerDay','totChol','BPMeds'])
```

In [31]:
```
df
```

Out[31]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	d
0	1	39	4.0	0	0.0	0.0	0	0	

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	d
1	0	46	2.0	0	0.0	0.0	0	0	
2	1	48	1.0	1	20.0	0.0	0	0	
3	0	61	3.0	1	30.0	0.0	0	1	
4	0	46	3.0	1	23.0	0.0	0	0	
...	...	...	...	...	...	...	...	...	
4233	1	50	1.0	1	1.0	0.0	0	1	
4234	1	51	3.0	1	43.0	0.0	0	0	
4235	0	48	2.0	1	20.0	NaN	0	0	
4236	0	44	1.0	1	15.0	0.0	0	0	
4237	0	52	2.0	0	0.0	0.0	0	0	

4238 rows × 16 columns

Missing Value Treatment

Since, 'glucose' and 'education' columns had a significant amount of null values, so we replaced them with the mean of values for their respective columns

In [32]:

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

In [33]:

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

In [34]:

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

In [35]:

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

In [36]:

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

In [37]:

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

In [38]:

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

In [39]:

```
df.isna().sum()
```

Out[39]:

```
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
```

Logistic Regression Model

In [42]:
```
#Splitting the dependent and independent variables.
x = df.drop("TenYearCHD",axis=1)
y = df['TenYearCHD']
```

In [43]:
```
x #checking the features
```

Out[43]:

	male	age	education	currentSmoker	cigsPerDay	BPMeds	prevalentStroke	prevalentHyp	d
0	1	39	4.0	0	0.0	0.00000	0	0	
1	0	46	2.0	0	0.0	0.00000	0	0	
2	1	48	1.0	1	20.0	0.00000	0	0	
3	0	61	3.0	1	30.0	0.00000	0	1	
4	0	46	3.0	1	23.0	0.00000	0	0	
...	...	...	...	...	...	...	...	...	
4233	1	50	1.0	1	1.0	0.00000	0	1	
4234	1	51	3.0	1	43.0	0.00000	0	0	
4235	0	48	2.0	1	20.0	0.02963	0	0	
4236	0	44	1.0	1	15.0	0.00000	0	0	
4237	0	52	2.0	0	0.0	0.00000	0	0	

4238 rows × 15 columns

Train Test Split

In [44]:
```
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.2,random_sta
```

In [46]:
```
y_train
```

Out[46]:
```
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
```

SVM Classifier

In [48]:

```
from sklearn.svm import SVC
from sklearn.metrics import accuracy_score
svc=SVC()
svc.fit(x_test,y_test)
acc = svc.score(x_test,y_test)*100
print(acc)
```

```
85.37735849056604
```

In [ ]: