

November 1, 2023

# 1 SVM Classifier

Exp no.: 10

Aim: SVM Classifier

```
[1]: #Name:Vedant Wankhade  
#Roll no.:74  
#Sec:B  
#Year:3rd Year
```

```
[2]: import pandas as pd  
import os  
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')
```

```
[3]: os.getcwd()
```

```
[3]: 'C:\\Users\\hp\\Downloads'
```

```
[4]: os.chdir('C:\\Users\\HP\\Desktop')
```

```
[5]: df=pd.read_csv('framingham.csv')
```

```
[6]: df.head()
```

```
[6]:   male  age  education  currentSmoker  cigsPerDay  BPMeds  prevalentStroke  \  
0     1   39         4.0              0         0.0     0.0              0  
1     0   46         2.0              0         0.0     0.0              0  
2     1   48         1.0              1        20.0     0.0              0  
3     0   61         3.0              1        30.0     0.0              0  
4     0   46         3.0              1        23.0     0.0              0  
  
prevalentHyp  diabetes  totChol  sysBP  diaBP  BMI  heartRate  glucose  \  

```

0	0	0	195.0	106.0	70.0	26.97	80.0	77.0
1	0	0	250.0	121.0	81.0	28.73	95.0	76.0
2	0	0	245.0	127.5	80.0	25.34	75.0	70.0
3	1	0	225.0	150.0	95.0	28.58	65.0	103.0
4	0	0	285.0	130.0	84.0	23.10	85.0	85.0

TenYearCHD	
0	0
1	0
2	0
3	1
4	0

```
[7]: df.tail()
```

```
[7]:
```

	male	age	education	currentSmoker	cigsPerDay	BPMeds	\
4233	1	50	1.0	1	1.0	0.0	
4234	1	51	3.0	1	43.0	0.0	
4235	0	48	2.0	1	20.0	NaN	
4236	0	44	1.0	1	15.0	0.0	
4237	0	52	2.0	0	0.0	0.0	

  

	prevalentStroke	prevalentHyp	diabetes	totChol	sysBP	diaBP	BMI	\
4233	0	1	0	313.0	179.0	92.0	25.97	
4234	0	0	0	207.0	126.5	80.0	19.71	
4235	0	0	0	248.0	131.0	72.0	22.00	
4236	0	0	0	210.0	126.5	87.0	19.16	
4237	0	0	0	269.0	133.5	83.0	21.47	

  

	heartRate	glucose	TenYearCHD
4233	66.0	86.0	1
4234	65.0	68.0	0
4235	84.0	86.0	0
4236	86.0	NaN	0
4237	80.0	107.0	0

```
[8]: df.info
```

```
[8]: <bound method DataFrame.info of
```

	male	age	education	currentSmoker	cigsPerDay	BPMeds	\
0	0		0.0	0.0	1	39	4.0
1	0		0.0	0.0	0	46	2.0
2	1		20.0	0.0	1	48	1.0
3	0		30.0	0.0	1	61	3.0
4	1		23.0	0.0	0	46	3.0
...	...	...	...	...	...	...	...
4233	1	50	1.0	0.0	1	50	1.0

4234	1	51	3.0	1	43.0	0.0
4235	0	48	2.0	1	20.0	NaN
4236	0	44	1.0	1	15.0	0.0
4237	0	52	2.0	0	0.0	0.0

	prevalentStroke	prevalentHyp	diabetes	totChol	sysBP	diaBP	BMI	\
0	0	0	0	195.0	106.0	70.0	26.97	
1	0	0	0	250.0	121.0	81.0	28.73	
2	0	0	0	245.0	127.5	80.0	25.34	
3	0	1	0	225.0	150.0	95.0	28.58	
4	0	0	0	285.0	130.0	84.0	23.10	
...	...	...	...	...	...	...	...	
4233	0	1	0	313.0	179.0	92.0	25.97	
4234	0	0	0	207.0	126.5	80.0	19.71	
4235	0	0	0	248.0	131.0	72.0	22.00	
4236	0	0	0	210.0	126.5	87.0	19.16	
4237	0	0	0	269.0	133.5	83.0	21.47	

	heartRate	glucose	TenYearCHD
0	80.0	77.0	0
1	95.0	76.0	0
2	75.0	70.0	0
3	65.0	103.0	1
4	85.0	85.0	0
...	...	...	...
4233	66.0	86.0	1
4234	65.0	68.0	0
4235	84.0	86.0	0
4236	86.0	NaN	0
4237	80.0	107.0	0

[4238 rows x 16 columns]>

```
[9]: df.describe()
```

```
[9]:
```

	male	age	education	currentSmoker	cigsPerDay	\
count	4238.000000	4238.000000	4133.000000	4238.000000	4209.000000	
mean	0.429212	49.584946	1.978950	0.494101	9.003089	
std	0.495022	8.572160	1.019791	0.500024	11.920094	
min	0.000000	32.000000	1.000000	0.000000	0.000000	
25%	0.000000	42.000000	1.000000	0.000000	0.000000	
50%	0.000000	49.000000	2.000000	0.000000	0.000000	
75%	1.000000	56.000000	3.000000	1.000000	20.000000	
max	1.000000	70.000000	4.000000	1.000000	70.000000	

  

	BPMeds	prevalentStroke	prevalentHyp	diabetes	totChol	\
count	4185.000000	4238.000000	4238.000000	4238.000000	4188.000000	

mean	0.029630	0.005899	0.310524	0.025720	236.721585
std	0.169584	0.076587	0.462763	0.158316	44.590334
min	0.000000	0.000000	0.000000	0.000000	107.000000
25%	0.000000	0.000000	0.000000	0.000000	206.000000
50%	0.000000	0.000000	0.000000	0.000000	234.000000
75%	0.000000	0.000000	1.000000	0.000000	263.000000
max	1.000000	1.000000	1.000000	1.000000	696.000000

	sysBP	diaBP	BMI	heartRate	glucose \
count	4238.000000	4238.000000	4219.000000	4237.000000	3850.000000
mean	132.352407	82.893464	25.802008	75.878924	81.966753
std	22.038097	11.910850	4.080111	12.026596	23.959998
min	83.500000	48.000000	15.540000	44.000000	40.000000
25%	117.000000	75.000000	23.070000	68.000000	71.000000
50%	128.000000	82.000000	25.400000	75.000000	78.000000
75%	144.000000	89.875000	28.040000	83.000000	87.000000
max	295.000000	142.500000	56.800000	143.000000	394.000000

	TenYearCHD
count	4238.000000
mean	0.151958
std	0.359023
min	0.000000
25%	0.000000
50%	0.000000
75%	0.000000
max	1.000000

```
[10]: df.isna().sum()
```

```
[10]: 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
```

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

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

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

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

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

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

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

```
[18]: df.isna().sum()
```

```
[18]: 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
```

```
[19]: df.isna().sum()
```

```
[19]: 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

```

```

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

```

```

[21]: x #checking the features

```

```

[21]:
    male  age  education  currentSmoker  cigsPerDay  BPMeds  \
0      1   39        4.0              0         0.0  0.00000
1      0   46        2.0              0         0.0  0.00000
2      1   48        1.0              1        20.0  0.00000
3      0   61        3.0              1        30.0  0.00000
4      0   46        3.0              1        23.0  0.00000
...    ...  ...      ...              ...      ...
4233    1   50        1.0              1         1.0  0.00000
4234    1   51        3.0              1        43.0  0.00000
4235    0   48        2.0              1        20.0  0.02963
4236    0   44        1.0              1        15.0  0.00000
4237    0   52        2.0              0         0.0  0.00000

    prevalentStroke  prevalentHyp  diabetes  totChol  sysBP  diaBP  BMI  \
0                  0            0         0    195.0   106.0   70.0  26.97
1                  0            0         0    250.0   121.0   81.0  28.73
2                  0            0         0    245.0   127.5   80.0  25.34
3                  0            1         0    225.0   150.0   95.0  28.58
4                  0            0         0    285.0   130.0   84.0  23.10
...              ...          ...      ...      ...      ...
4233                0            1         0    313.0   179.0   92.0  25.97
4234                0            0         0    207.0   126.5   80.0  19.71
4235                0            0         0    248.0   131.0   72.0  22.00
4236                0            0         0    210.0   126.5   87.0  19.16
4237                0            0         0    269.0   133.5   83.0  21.47

    heartRate  glucose
0         80.0  77.000000
1         95.0  76.000000
2         75.0  70.000000
3         65.0 103.000000
4         85.0  85.000000
...         ...      ...
4233        66.0  86.000000

```

```
4234      65.0    68.000000
4235      84.0    86.000000
4236      86.0    81.966753
4237      80.0   107.000000
```

```
[4238 rows x 15 columns]
```

## 2 Train Test Split

```
[22]: x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.
      ↪2,random_state=42)
```

```
[23]: y_train
```

```
[23]: 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
```

## 3 SVM Classifier

```
[24]: 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
```