

l0ingiokq

December 13, 2024

## 1 Logistic Regression Algorithm

```
[2]: #Exp no. : 10
```

```
[4]: #Name : Devesh J Arbat  
#Roll no. : 06  
#Section : A
```

```
[6]: 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')
```

```
[8]: import os
```

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

```
[10]: 'C:\\Users\\salik\\DSS Practical'
```

```
[12]: os.chdir("C:\\Users\\salik\\DSS Practical")
```

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

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

```
[16]:
```

	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

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

```
[18]:
```

	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

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

```
[20]:
```

	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

```
[22]: 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

```

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

```

[24]: 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

```

```
[26]: df
```

```

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

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

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

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

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

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

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

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

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

```
[42]: 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

```

```

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

```

```

[46]: x

```

```

[46]:      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]

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

```
[50]: y_train
```

```
[50]: 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
```

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

```
[52]: 0.8498525073746312
```

```
[ ]:
```