Chapter 3 - Ex4: LowBirthWeight

Cung cấp dữ liệu birthweight_reduced.csv

Yêu cầu: Áp dụng Logistic Regression để thực hiện việc xác định trẻ có thiếu cân hay không dựa vào thông tin còn lại.

1. Hãy đọc dữ liệu từ tập tin này. Chuẩn hóa dữ liệu nếu cần.
2. Tạo X_train, X_test, y_train, y_test từ dữ liệu đọc được với tỷ lệ dữ liệu test là 0.3
3. Áp dụng thuật toán Logistic Regression
4. Kiểm tra độ chính xác
5. Tìm kết quả Cho dữ liệu Test: X_now = [[12, 18, 4.5, 35, 1, 41, 7, 65, 125, 37, 14, 25, 68, 1, 1]]

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
import math
from pandas import DataFrame
from sklearn import preprocessing
```

In [2]:
```
# https://www.sheffield.ac.uk/mash/data
data = pd.read_csv("birthweight_reduced.csv")
```

In [3]:
```
data.head()
```

Out[3]:

	id	headcirumference	length	Birthweight	Gestation	smoker	motherage	mnocig	mheight	ı
0	1313	12	17	5.8	33	0	24	0	58	
1	431	12	19	4.2	33	1	20	7	63	
2	808	13	19	6.4	34	0	26	0	65	
3	300	12	18	4.5	35	1	41	7	65	
4	516	13	18	5.8	35	1	20	35	67	

In [4]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 42 entries, 0 to 41
Data columns (total 17 columns):
id                  42 non-null int64
headcirumference    42 non-null int64
length              42 non-null int64
Birthweight         42 non-null float64
Gestation           42 non-null int64
smoker              42 non-null int64
motherage           42 non-null int64
mnocig              42 non-null int64
mheight             42 non-null int64
mppwt               42 non-null int64
fage                42 non-null int64
fedyrs              42 non-null int64
fnocig              42 non-null int64
fheight             42 non-null int64
lowbwt              42 non-null int64
mage35              42 non-null int64
LowBirthWeight      42 non-null object
dtypes: float64(1), int64(15), object(1)
memory usage: 5.7+ KB
```

In [5]:
```
data.describe()
```

Out[5]:

	id	headcirumference	length	Birthweight	Gestation	smoker	motherage	
count	42.000000	42.000000	42.000000	42.000000	42.000000	42.000000	42.000000	42
mean	894.071429	13.261905	19.928571	7.264286	39.190476	0.523810	25.547619	9
std	467.616186	0.766987	1.112958	1.329739	2.643336	0.505487	5.666342	12
min	27.000000	12.000000	17.000000	4.200000	33.000000	0.000000	18.000000	0
25%	537.250000	13.000000	19.000000	6.450000	38.000000	0.000000	20.250000	0
50%	821.000000	13.000000	20.000000	7.250000	39.500000	1.000000	24.000000	4
75%	1269.500000	14.000000	21.000000	8.000000	41.000000	1.000000	29.000000	15
max	1764.000000	15.000000	22.000000	10.000000	45.000000	1.000000	41.000000	50

In [6]:
```
X = data.iloc[:,1:-1]
X.head()
```

Out[6]:

	headcirumference	length	Birthweight	Gestation	smoker	motherage	mnocig	mheight	mppwt
0	12	17	5.8	33	0	24	0	58	99
1	12	19	4.2	33	1	20	7	63	109
2	13	19	6.4	34	0	26	0	65	140
3	12	18	4.5	35	1	41	7	65	125
4	13	18	5.8	35	1	20	35	67	125

In [7]:
```
Y = data[['LowBirthWeight']]
Y.head()
```

Out[7]:

	LowBirthWeight
0	Low
1	Low
2	Normal
3	Low
4	Low

In [8]:
```
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.3)
```

In [9]:
```
from sklearn.linear_model import LogisticRegression
```

In [10]:
```
clf = LogisticRegression(solver='liblinear')
```

In [11]:
```
clf.fit(X_train,Y_train.values.ravel())
```

Out[11]:
```
LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
                   intercept_scaling=1, l1_ratio=None, max_iter=100,
                   multi_class='warn', n_jobs=None, penalty='l2',
                   random_state=None, solver='liblinear', tol=0.0001, verbose=
0,
                   warm_start=False)
```

In [12]:
```
clf.intercept_
```

Out[12]:
```
array([-0.01350322])
```

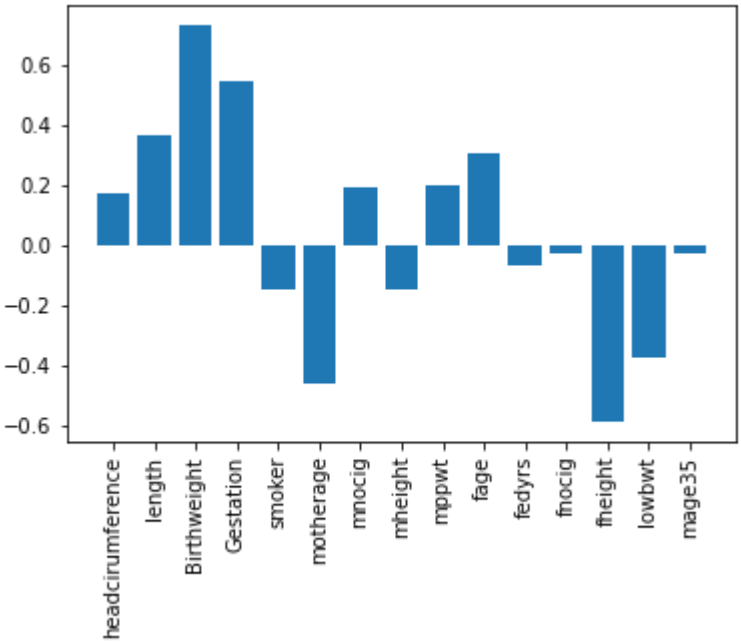
In [13]:
```
feature_names = pd.Series(X_train.columns.values)
feature_names
```

Out[13]:
```
0     headcirumference
1               length
2          Birthweight
3            Gestation
4               smoker
5            motherage
6               mnocig
7              mheight
8                mppwt
9                fage
10              fedyrs
11              fnocig
12             fheight
13              lowbwt
14              mage35
dtype: object
```

In [14]:
```
coef = pd.Series(np.array(clf.coef_[0]))
coef
```

Out[14]:
```
0     0.170145
1     0.360639
2     0.730223
3     0.540877
4    -0.150854
5    -0.461848
6     0.190264
7    -0.148746
8     0.199724
9     0.302947
10   -0.070200
11   -0.030546
12   -0.586670
13   -0.378078
14   -0.028775
dtype: float64
```

In [15]:
```
plt.bar(feature_names, coef)
plt.xticks(rotation='vertical')
plt.show()
```



In [16]:
```
Y_pred = clf.predict(X_test)
Y_pred
```

Out[16]:
```
array(['Normal', 'Normal', 'Normal', 'Normal', 'Normal', 'Normal',
       'Normal', 'Normal', 'Normal', 'Normal', 'Normal', 'Normal',
       'Normal'], dtype=object)
```

In [17]:
```
from sklearn.metrics import accuracy_score
print("Accuracy is ", accuracy_score(Y_test,Y_pred)*100,"%")
```

```
Accuracy is  92.3076923076923 %
```

In [18]:
```
print('Training/ Score Scikit learn: ', clf.score(X_train,Y_train))
```

```
Training/ Score Scikit learn:  1.0
```

In [19]:
```
print('Testing/ Score Scikit learn: ', clf.score(X_test,Y_test))
```

```
Testing/ Score Scikit learn:  0.9230769230769231
```

- Nhận xét: R^2 của Training và Testing không chênh lệch nhiều, model không bị overfitting
- Dữ liệu cần được bổ sung thêm vì chỉ có 42 mẫu cho cả training và testing là khá ít

In [20]:
```
X_now = [[12, 18, 4.5, 35, 1, 41, 7, 65, 125, 37, 14, 25, 68, 1, 1]]
Y_now = clf.predict(X_now)
Y_now
```

Out[20]:
```
array(['Low'], dtype=object)
```

In [21]:
```
# hay lua chon lai so luong thuoc tinh phu hop nhat cho bai toan nay
# build lai model dua tren so luong thuoc tinh da chon
# so sanh voi ket qua da lam cho 15 thuoc tinh o tren
```