logistic-regression

October 16, 2023

[2]:
```
# Loading libraries
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
import seaborn as sns
```

[3]:
```
# Import dataframe
df = pd.read_csv('Smoking Data.csv')
```

[4]:
```
df.head()
```

[4]:

	region	age	sex	bmi	children	smoker
0	southwest	19	female	27.900	0	yes
1	southeast	18	male	33.770	1	no
2	southeast	28	male	33.000	3	no
3	northwest	33	male	22.705	0	no
4	northwest	32	male	28.880	0	no

0.0.1 Encoding

[5]:
```
df['smoker'] = df['smoker'].replace(['yes', 'no'],[1,0])
```

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

[6]:

	region	age	sex	bmi	children	smoker
0	southwest	19	female	27.900	0	1
1	southeast	18	male	33.770	1	0
2	southeast	28	male	33.000	3	0
3	northwest	33	male	22.705	0	0
4	northwest	32	male	28.880	0	0

[7]:
```
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
```

[8]:
```
from pandas.core.dtypes.common import is_numeric_dtype
for col in df.columns:
    if is_numeric_dtype(df[col]):
```

```
        continue
    else:
        df[col] = le.fit_transform(df[col])
```

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

[9]:

	region	age	sex	bmi	children	smoker
0	3	19	0	27.900	0	1
1	2	18	1	33.770	1	0
2	2	28	1	33.000	3	0
3	1	33	1	22.705	0	0
4	1	32	1	28.880	0	0

[10]:
```
x = df.drop('smoker', axis=1)
y = df.smoker
```

[43]:
```
x.head()
```

[43]:

	region	age	sex	bmi	children
0	3	19	0	27.900	0
1	2	18	1	33.770	1
2	2	28	1	33.000	3
3	1	33	1	22.705	0
4	1	32	1	28.880	0

[44]:
```
y.head()
```

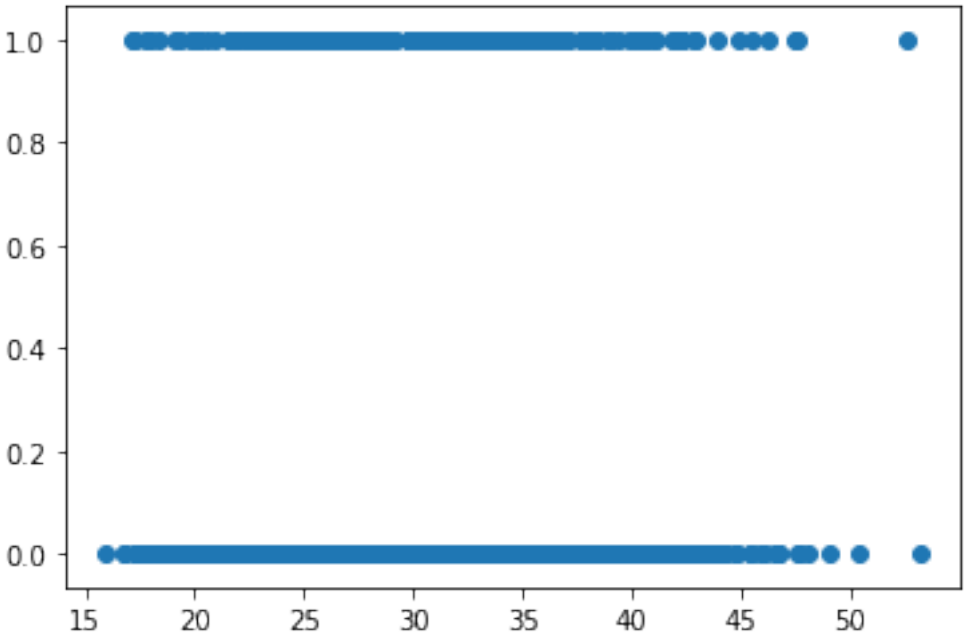
[44]:
```
0    1
1    0
2    0
3    0
4    0
Name: smoker, dtype: int64
```

[45]:
```
y.value_counts()
```

[45]:
```
0    1064
1     274
Name: smoker, dtype: int64
```

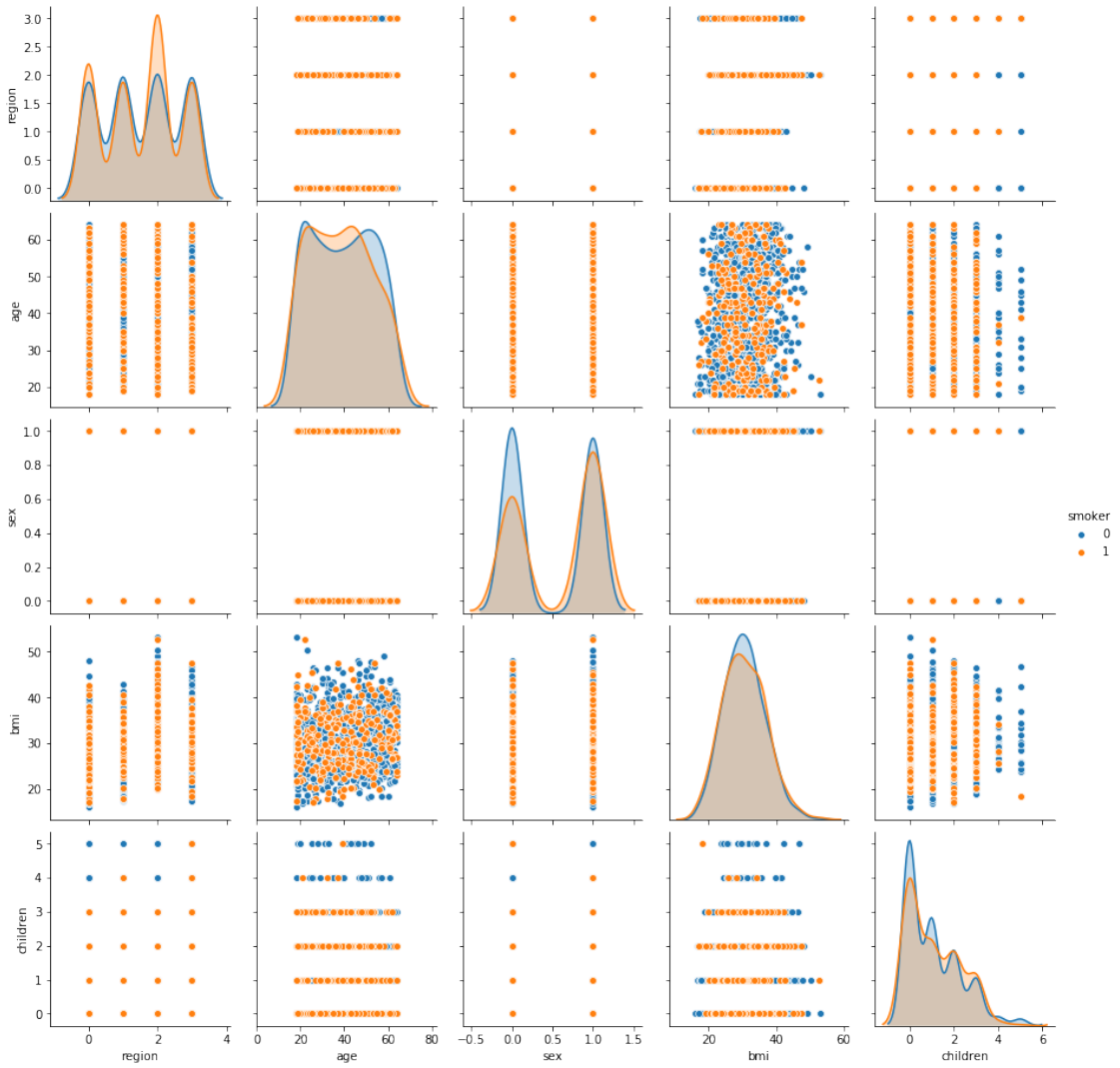
[46]:
```
plt.scatter(x.bmi,y)
```

[46]:
```
<matplotlib.collections.PathCollection at 0x2047cea0ac8>
```



[48]:
```
sns.pairplot(df, hue='smoker', height=2.5)
```

[48]: <seaborn.axisgrid.PairGrid at 0x2047de359c8>



0.1 Logistic regression

[20]:
```
from sklearn.linear_model import LogisticRegression
lr = LogisticRegression()
lr.fit(x,y)
```

[20]:
```
LogisticRegression()
```

[21]:
```
lr.coef_
```

[21]:
```
array([[-0.00703725, -0.00429942,  0.36977731,  0.00138905,  0.01527331]])
```

[22]:
```
lr.intercept_
```

[22]:
```
array([-1.43500106])
```

[25]:
```
# Predicted probability of x
lr.predict_proba(x)
```

[25]:
```
array([[0.81743236, 0.18256764],
       [0.74922937, 0.25077063],
       [0.75176047, 0.24823953],
       …,
       [0.81385841, 0.18614159],
       [0.81914467, 0.18085533],
       [0.840764  , 0.159236  ]])
```

[28]:
```
# predicted y
lr.predict(x)
```

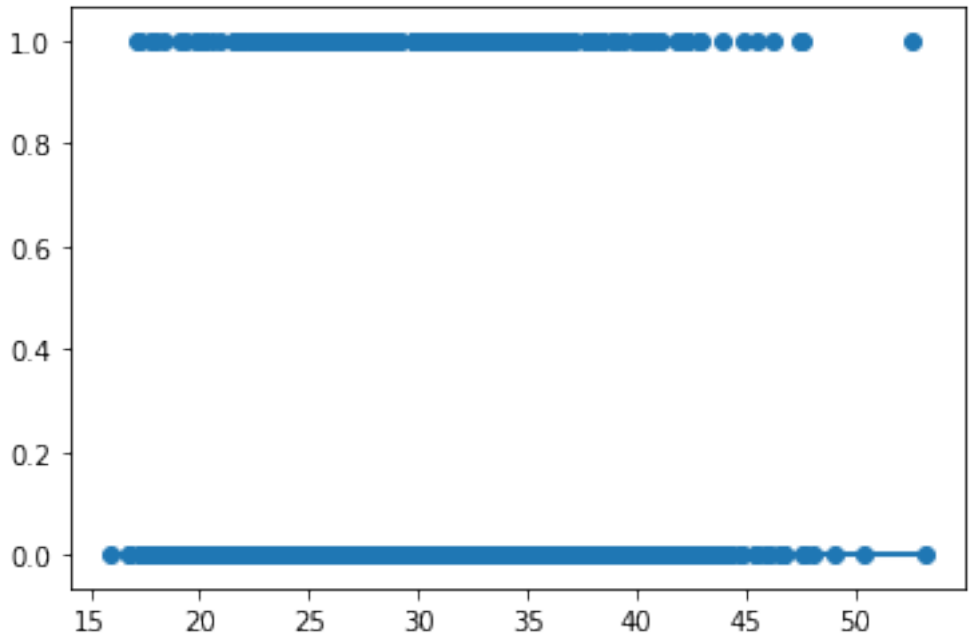
[28]:
```
array([0, 0, 0, …, 0, 0, 0], dtype=int64)
```

[31]:
```
np.array(y)
```

[31]:
```
array([1, 0, 0, …, 0, 0, 1], dtype=int64)
```

[38]:
```
plt.scatter(x.bmi,y)
plt.plot(x.bmi,lr.predict(x))
```

[38]:
```
[<matplotlib.lines.Line2D at 0x20477f9ab88>]
```



[29]:
```
# Training Score
lr.score(x,y)
```

[29]: 0.7952167414050823