logistic-regression

December 5, 2023

[1]:

```
import seaborn as sns
import pandas as pd
import numpy as np
```

[2]:

```
df=sns.load_dataset('iris')
df.head()
```

[2]:

```
   sepal_length  sepal_width  petal_length  petal_width species
0           5.1          3.5           1.4          0.2  setosa
1           4.9          3.0           1.4          0.2  setosa
2           4.7          3.2           1.3          0.2  setosa
3           4.6          3.1           1.5          0.2  setosa
4           5.0          3.6           1.4          0.2  setosa
```

[3]:

```
df['species'].unique()
```

[3]:

```
array(['setosa', 'versicolor', 'virginica'], dtype=object)
```

[4]:

```
df.isnull().sum()
```

[4]:

```
sepal_length    0
sepal_width     0
petal_length    0
petal_width     0
species         0
dtype: int64
```

[5]:

```
df=df[df['species']!='setosa']
```

[6]:

```
df.head()
```

[6]:

```
    sepal_length  sepal_width  petal_length  petal_width     species
50           7.0          3.2           4.7          1.4  versicolor
51           6.4          3.2           4.5          1.5  versicolor
52           6.9          3.1           4.9          1.5  versicolor
53           5.5          2.3           4.0          1.3  versicolor
54           6.5          2.8           4.6          1.5  versicolor
```

[7]:

```
df['species']=df['species'].map({'versicolor':0,'virginica':1})
```

[8]:

```
df.head()
```

[8]:

```
    sepal_length  sepal_width  petal_length  petal_width  species
50           7.0          3.2           4.7          1.4        0
51           6.4          3.2           4.5          1.5        0
52           6.9          3.1           4.9          1.5        0
53           5.5          2.3           4.0          1.3        0
54           6.5          2.8           4.6          1.5        0
```

[9]:

```
### Split dataset into independent and dependent features
X=df.iloc[:,:-1]
y=df.iloc[:,-1]
```

[12]:

```
X
```

[12]:

```
     sepal_length  sepal_width  petal_length  petal_width
50            7.0          3.2           4.7          1.4
51            6.4          3.2           4.5          1.5
52            6.9          3.1           4.9          1.5
53            5.5          2.3           4.0          1.3
54            6.5          2.8           4.6          1.5
..            …            …             …            …
145           6.7          3.0           5.2          2.3
146           6.3          2.5           5.0          1.9
147           6.5          3.0           5.2          2.0
148           6.2          3.4           5.4          2.3
149           5.9          3.0           5.1          1.8

[100 rows x 4 columns]
```

[13]:

```
y
```

[13]:

```
50     0
51     0
52     0
53     0
54     0
      ..
145    1
146    1
147    1
148    1
149    1
Name: species, Length: 100, dtype: int64
```

[14]:

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.25, random_state=42)

from sklearn.linear_model import LogisticRegression
classifier=LogisticRegression()

from sklearn.model_selection import GridSearchCV
parameter={'penalty':['l1','l2','elasticnet'],'C':
 ↪[1,2,3,4,5,6,10,20,30,40,50],'max_iter':[100,200,300]}

classifier_regressor=GridSearchCV(classifier,param_grid=parameter,scoring='accuracy',cv=5)

classifier_regressor.fit(X_train,y_train)
```

```
/Users/poornam/anaconda3/lib/python3.11/site-
packages/sklearn/model_selection/_validation.py:425: FitFailedWarning:
330 fits failed out of a total of 495.
The score on these train-test partitions for these parameters will be set to
nan.
If these failures are not expected, you can try to debug them by setting
error_score='raise'.

Below are more details about the failures:
--------------------------------------------------------------------------------
165 fits failed with the following error:
Traceback (most recent call last):
  File "/Users/poornam/anaconda3/lib/python3.11/site-
packages/sklearn/model_selection/_validation.py", line 732, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "/Users/poornam/anaconda3/lib/python3.11/site-packages/sklearn/base.py",
line 1151, in wrapper
    return fit_method(estimator, *args, **kwargs)
           ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

  File "/Users/poornam/anaconda3/lib/python3.11/site-
packages/sklearn/linear_model/_logistic.py", line 1168, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
             ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

  File "/Users/poornam/anaconda3/lib/python3.11/site-
packages/sklearn/linear_model/_logistic.py", line 56, in _check_solver
    raise ValueError(
ValueError: Solver lbfgs supports only 'l2' or 'none' penalties, got l1 penalty.

--------------------------------------------------------------------------------
165 fits failed with the following error:
Traceback (most recent call last):
  File "/Users/poornam/anaconda3/lib/python3.11/site-
```

```
packages/sklearn/model_selection/_validation.py", line 732, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "/Users/poornam/anaconda3/lib/python3.11/site-packages/sklearn/base.py",
line 1151, in wrapper
    return fit_method(estimator, *args, **kwargs)
           ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
  File "/Users/poornam/anaconda3/lib/python3.11/site-
packages/sklearn/linear_model/_logistic.py", line 1168, in fit
    solver = _check_solver(self.solver, self.penalty, self.dual)
             ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
  File "/Users/poornam/anaconda3/lib/python3.11/site-
packages/sklearn/linear_model/_logistic.py", line 56, in _check_solver
    raise ValueError(
ValueError: Solver lbfgs supports only 'l2' or 'none' penalties, got elasticnet
penalty.

  warnings.warn(some_fits_failed_message, FitFailedWarning)
/Users/poornam/anaconda3/lib/python3.11/site-
packages/sklearn/model_selection/_search.py:976: UserWarning: One or more of the
test scores are non-finite: [       nan 0.97333333        nan        nan
0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan        nan 0.97333333        nan
        nan 0.97333333        nan]
  warnings.warn(
```

```
[14]: GridSearchCV(cv=5, estimator=LogisticRegression(),
                   param_grid={'C': [1, 2, 3, 4, 5, 6, 10, 20, 30, 40, 50],
                               'max_iter': [100, 200, 300],
                               'penalty': ['l1', 'l2', 'elasticnet']},
                   scoring='accuracy')
```

```
[15]: print(classifier_regressor.best_params_)
```

```
{'C': 1, 'max_iter': 100, 'penalty': 'l2'}
```

[16]:

```
print(classifier_regressor.best_score_)
```

```
0.9733333333333334
```

[18]:

```
##prediction
y_pred=classifier_regressor.predict(X_test)
## accuracy score
from sklearn.metrics import accuracy_score,classification_report
score=accuracy_score(y_pred,y_test)
print(score)
```

```
0.92
```

[19]:

```
print(classification_report(y_pred,y_test))
```

```
              precision    recall  f1-score   support

           0       0.93      0.93      0.93        14
           1       0.91      0.91      0.91        11

    accuracy                           0.92        25
   macro avg       0.92      0.92      0.92        25
weighted avg       0.92      0.92      0.92        25
```

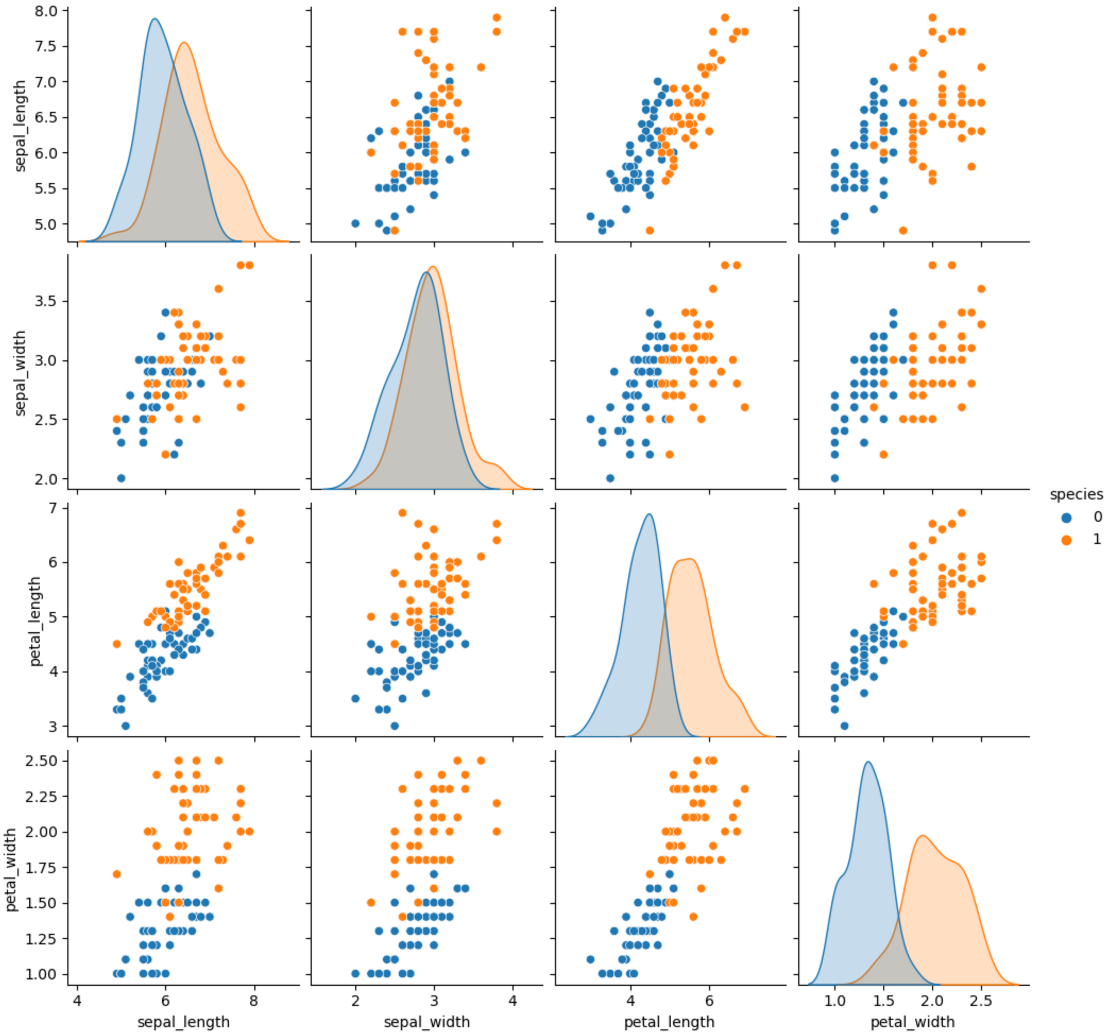
[20]:

```
##EDA
sns.pairplot(df,hue='species')
```

```
/Users/poornam/anaconda3/lib/python3.11/site-packages/seaborn/axisgrid.py:118:
UserWarning: The figure layout has changed to tight
  self._figure.tight_layout(*args, **kwargs)
```

[20]:

```
<seaborn.axisgrid.PairGrid at 0x13c2ca8d0>
```



```
[21]: df.corr()
```

```
[21]:               sepal_length  sepal_width  petal_length  petal_width   species
      sepal_length      1.000000     0.553855      0.828479     0.593709  0.494305
      sepal_width       0.553855     1.000000      0.519802     0.566203  0.308080
      petal_length      0.828479     0.519802      1.000000     0.823348  0.786424
      petal_width       0.593709     0.566203      0.823348     1.000000  0.828129
      species           0.494305     0.308080      0.786424     0.828129  1.000000
```

```
[ ]:
```