```
# importing modules and packages
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, mean_absolute_error
from sklearn import preprocessing

from google.colab import files
uploaded = files.upload()
```

```
Choose Files Real-estate1.csv
• Real-estate1.csv(text/csv) - 21968 bytes, last modified: 10/30/2023 - 100% done
Saving Real-estate1.csv to Real-estate1.csv
```

```
# importing data
df = pd.read_csv('Real-estate1.csv')
df.drop('No', inplace = True,axis=1)

print(df.head())
print(df.columns)
```

```
   X1 transaction date  X2 house age  X3 distance to the nearest MRT station  \
0             2012.917          32.0                               84.87882
1             2012.917          19.5                              306.59470
2             2013.583          13.3                              561.98450
3             2013.500          13.3                              561.98450
4             2012.833           5.0                              390.56840

   X4 number of convenience stores  X5 latitude  X6 longitude  \
0                               10     24.98298     121.54024
1                                9     24.98034     121.53951
2                                5     24.98746     121.54391
3                                5     24.98746     121.54391
4                                5     24.97937     121.54245

   Y house price of unit area
0                        37.9
1                        42.2
2                        47.3
3                        54.8
4                        43.1
Index(['X1 transaction date', 'X2 house age',
       'X3 distance to the nearest MRT station',
       'X4 number of convenience stores', 'X5 latitude', 'X6 longitude',
       'Y house price of unit area'],
      dtype='object')
```

```
# plotting a scatterplot
sns.scatterplot(x='X4 number of convenience stores',
                y='Y house price of unit area', data=df)
```

```
<Axes: xlabel='X4 number of convenience stores', ylabel='Y house price of unit area'>
```

```
# creating feature variables
x = df.drop('Y house price of unit area',axis= 1)
y = df['Y house price of unit area']
print(x)
print(y)
```

```
     X1 transaction date  X2 house age  \
0               2012.917          32.0
1               2012.917          19.5
2               2013.583          13.3
3               2013.500          13.3
4               2012.833           5.0
..                   ...           ...
409             2013.000          13.7
410             2012.667           5.6
411             2013.250          18.8
412             2013.000           8.1
413             2013.500           6.5

     X3 distance to the nearest MRT station  X4 number of convenience stores  \
0                                  84.87882                               10
1                                 306.59470                                9
2                                 561.98450                                5
3                                 561.98450                                5
4                                 390.56840                                5
..                                      ...                              ...
409                              4082.01500                                0
410                                90.45606                                9
411                               390.96960                                7
412                               104.81010                                5
413                                90.45606                                9

     X5 latitude  X6 longitude
0       24.98298     121.54024
1       24.98034     121.53951
2       24.98746     121.54391
3       24.98746     121.54391
4       24.97937     121.54245
..           ...           ...
409     24.94155     121.50381
410     24.97433     121.54310
411     24.97923     121.53986
412     24.96674     121.54067
413     24.97433     121.54310

[414 rows x 6 columns]
0      37.9
1      42.2
2      47.3
3      54.8
4      43.1
       ...
409    15.4
410    50.0
411    40.6
412    52.5
413    63.9
Name: Y house price of unit area, Length: 414, dtype: float64
```

```
# creating train and test sets
x_train, x_test, y_train, y_test = train_test_split(
    x, y, test_size=0.3, random_state=101)
```

```
# creating a regression model
model = LinearRegression()
```

```
# fitting the model
model.fit(x_train,y_train)
```

```
▾ LinearRegression
LinearRegression()
```

```
# making predictions
predictions = model.predict(x_test)
```

```
# model evaluation
print(
    'mean_squared_error : ', mean_squared_error(y_test, predictions))
print(
    'mean_absolute_error : ', mean_absolute_error(y_test, predictions))
```

```
 mean_squared_error :  46.21179783492909
 mean_absolute_error :  5.392293684756193
```

```
# import libraries
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, confusion_matrix
import matplotlib.pyplot as plt
import numpy as np

# load the iris dataset
iris = load_iris()
x = iris.data
y = iris.target

# split the data into training and testing sets
x_train, x_test,\
y_train, y_test = train_test_split(x, y,
                                   test_size=0.2,
                                   random_state=42)

# create a Multinomial logistic regression model
multi_logreg = LogisticRegression(multi_class='multinomial',
                                  solver='lbfgs')
multi_logreg.fit(x_train, y_train)

# create a One-vs-Rest logistic regression model
ovr_logreg = LogisticRegression(multi_class='ovr',
                                solver='liblinear')
ovr_logreg.fit(x_train, y_train)
```

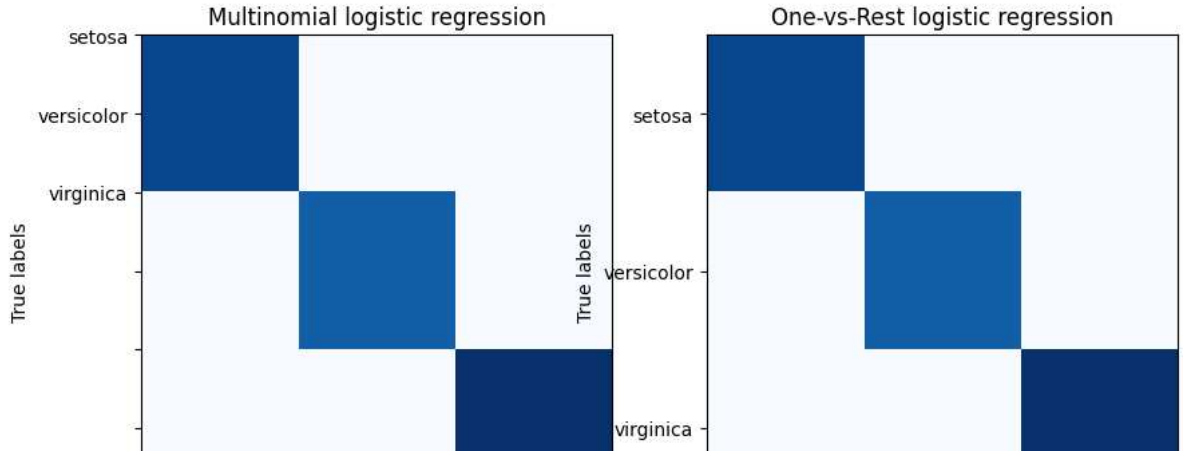
```
/usr/local/lib/python3.10/dist-packages/sklearn/linear_model/_logistic.py:458: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
```

▾ LogisticRegression

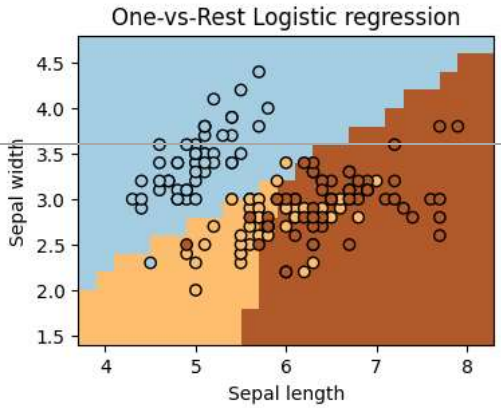
```
# make predictions using the trained models
y_pred_multi = multi_logreg.predict(x_test)
y_pred_ovr = ovr_logreg.predict(x_test)

# evaluate the performance of the models
# using accuracy score and confusion matrix
print('Multinomial logistic regression accuracy:',
      accuracy_score(y_test, y_pred_multi))
print('One-vs-Rest logistic regression accuracy:',
      accuracy_score(y_test, y_pred_ovr))

conf_mat_multi = confusion_matrix(y_test, y_pred_multi)
conf_mat_ovr = confusion_matrix(y_test, y_pred_ovr)

# plot the confusion matrices
fig, axs = plt.subplots(ncols=2, figsize=(10, 5))
axs[0].imshow(conf_mat_multi, cmap=plt.cm.Blues)
axs[0].set_title('Multinomial logistic regression')
axs[0].set_xlabel('Predicted labels')
axs[0].set_ylabel('True labels')
axs[0].set_xticks(np.arange(len(iris.target_names)))
axs[0].set_xticklabels(iris.target_names)
axs[0].set_yticklabels(iris.target_names)
axs[1].imshow(conf_mat_ovr, cmap=plt.cm.Blues)
axs[1].set_title('One-vs-Rest logistic regression')
axs[1].set_xlabel('Predicted labels')
```

```
axs[1].set_ylabel('True labels')
axs[1].set_xticks(np.arange(len(iris.target_names)))
axs[1].set_xticklabels(iris.target_names)
axs[1].set_yticks(np.arange(len(iris.target_names)))
axs[1].set_yticklabels(iris.target_names)
plt.show()
```

```
Multinomial logistic regression accuracy: 1.0
One-vs-Rest logistic regression accuracy: 1.0
<ipython-input-11-aa80e91df5ca>:23: UserWarning: FixedFormatter should only be used together with FixedLocator
  axs[0].set_yticklabels(iris.target_names)
```




```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.datasets import load_iris
from sklearn.linear_model import LogisticRegression

iris=load_iris()

X=iris.data[:,:2]
y=iris.target

clf=LogisticRegression(random_state=0,
                       multi_class='ovr',
                       solver='liblinear')

clf.fit(X,y)

x_min, x_max=X[:,0].min()-.5,X[:,0].max()+.5
y_min, y_max=X[:,1].min()-.5,X[:,1].max()+.5
xx,yy=np.meshgrid(np.arange(x_min,x_max,0.2),
                  np.arange(y_min,y_max,0.2))
Z=clf.predict(np.c_[xx.ravel(),yy.ravel()])
Z=Z.reshape(xx.shape)
plt.figure(1,figsize=(4,3))
plt.pcolormesh(xx,yy,Z,cmap=plt.cm.Paired)
plt.scatter(X[:,0],X[:,1],c=y,edgecolors='k',
            cmap=plt.cm.Paired)
plt.xlabel('Sepal length')
plt.ylabel('Sepal width')
plt.title('One-vs-Rest Logistic regression')
plt.show()
```


One-vs-Rest Logistic regression
Sepal width
Sepal length
4.5
4.0
3.5
3.0
2.5
2.0
1.5
4
5
6
7
8

+ Kode + Teks