Chapter 3: Demo Multi-class Classisfication

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
```

In [2]:

```
from google.colab import drive
drive.mount("/content/gdrive", force_remount=True)

path = '/content/gdrive/My Drive/LDS6_MachineLearning/'
```

```
Mounted at /content/gdrive
```

In [3]:

```
iris = pd.read_excel(path + "practice/Chapter3_Logistic_Regression/Iris.xls")
iris.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   sepallength  150 non-null    float64
 1   sepalwidth   150 non-null    float64
 2   petallength  150 non-null    float64
 3   petalwidth   150 non-null    float64
 4   iris         150 non-null    object 
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

In [4]:

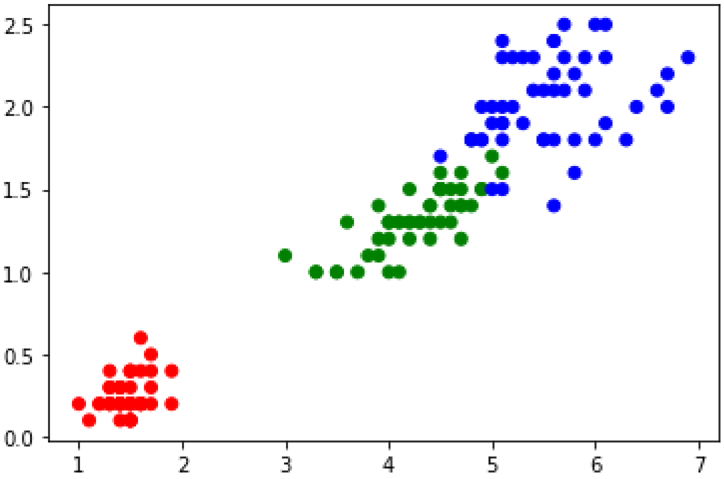
```
iris_class = {'Iris-setosa':0, 'Iris-versicolor':1, 'Iris-virginica':2}
iris['species_num'] = [iris_class[i] for i in iris.iris]
iris.head()
```

Out[4]:

	sepallength	sepalwidth	petallength	petalwidth	iris	species_num
0	5.1	3.5	1.4	0.2	Iris-setosa	0
1	4.9	3.0	1.4	0.2	Iris-setosa	0
2	4.7	3.2	1.3	0.2	Iris-setosa	0
3	4.6	3.1	1.5	0.2	Iris-setosa	0
4	5.0	3.6	1.4	0.2	Iris-setosa	0

In [5]:
```
def make_color(value):
    color = 'yellow'
    if value == 0:
        color = 'red'
    elif value == 1:
        color = 'green'
    else:
        color = 'blue'
    return color
```

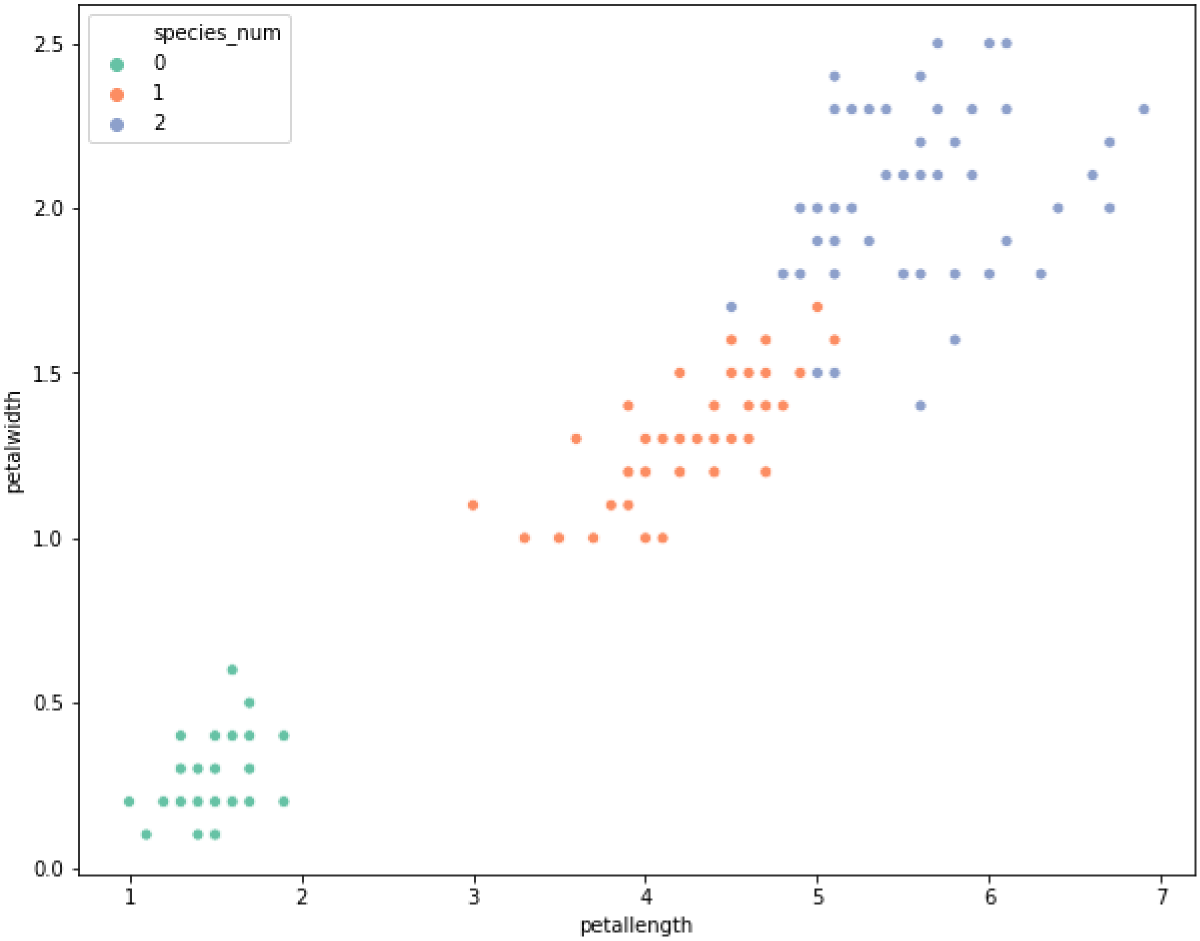
In [6]:
```
pentallength = iris.petallength.values
petalwidth = iris.petalwidth.values
types = iris.species_num.values
color= [make_color(x) for x in types]
plt.scatter(pentallength, petalwidth, color=color)
plt.show()
```



In [7]:

```
import seaborn as sns
plt.figure(figsize=(10,8))
sns.scatterplot(x="petallength", y="petalwidth",
                      hue="species_num", palette="Set2", data=iris)
plt.show()
```

```
/usr/local/lib/python3.6/dist-packages/statsmodels/tools/_testing.py:19: Future
Warning: pandas.util.testing is deprecated. Use the functions in the public API
at pandas.testing instead.
  import pandas.util.testing as tm
```



In [8]:
```
X = iris.drop(['iris', 'species_num'], axis=1)
y = iris.species_num
```

In [9]:
```
X.head()
```

Out[9]:

	sepallength	sepalwidth	petallength	petalwidth
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2

In [10]:
```
y.head()
```

Out[10]:
```
0    0
1    0
2    0
3    0
4    0
Name: species_num, dtype: int64
```

In [11]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.20,
                                                    random_state = 42)
# ....
```

In [12]:
```
from sklearn.metrics import accuracy_score
from sklearn.linear_model import LogisticRegression
```

In [13]:
```
# https://scikit-learn.org/stable/modules/generated/sklearn.linear_model.Logisti
clf = LogisticRegression(solver='lbfgs', multi_class='multinomial')
```

In [14]:
```
clf.fit(X_train, y_train)
# Tham so C???? => value???
```

Out[14]:
```
LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
                   intercept_scaling=1, l1_ratio=None, max_iter=100,
                   multi_class='multinomial', n_jobs=None, penalty='l2',
                   random_state=None, solver='lbfgs', tol=0.0001, verbose=0,
                   warm_start=False)
```

In [15]:
```
y_pred = clf.predict(X_test)
```

In [16]:

```
# Kiểm tra độ chính xác
print("The prediction accuracy is: ", clf.score(X_test,y_test)*100,"%")
```

```
The prediction accuracy is:  100.0 %
```

In [17]:

```
df = pd.DataFrame({'Actual': pd.DataFrame(y_test.values)[0].values,
                   'Prediction': pd.DataFrame(y_pred)[0].values})
df.head()
```

Out[17]:

	Actual	Prediction
0	1	1
1	0	0
2	2	2
3	1	1
4	1	1

In [18]:

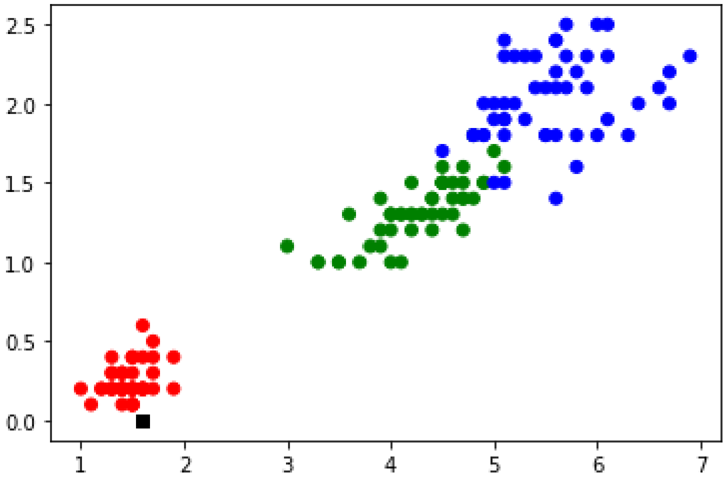
```
x_now = [[4.8, 3.3, 1.6, 0.25]]
y_now = clf.predict(x_now)
y_now
```

Out[18]:

```
array([0])
```

In [19]:

```
types = iris.species_num.values
color= [make_color(x) for x in types]
plt.scatter(pentallength, petalwidth, color=color)
plt.scatter(x_now[0][2], y_now, color='k', marker = 's')
plt.show()
```



In [19]: