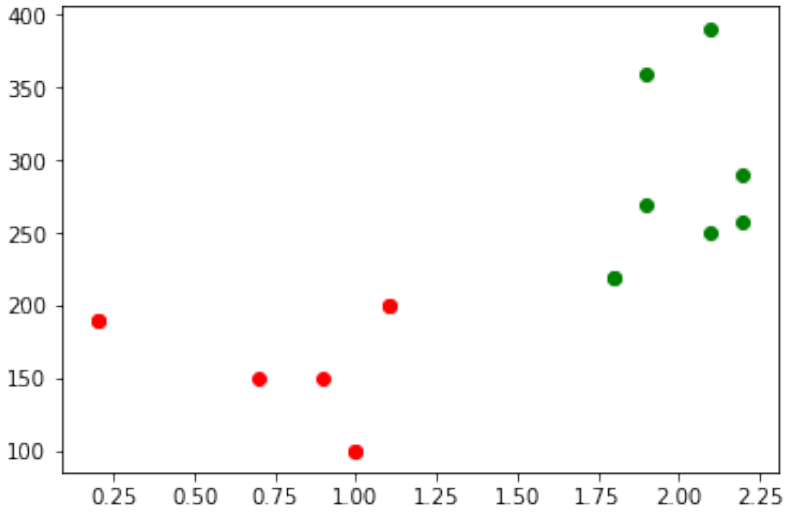
数据标准化

In [1]:
```
import numpy as np
from ML.knn import kNN_classify
from ML.model_selection import train_test_split
from ML.metrics import accuracy_score
import matplotlib.pyplot as plt
```

In [2]:
```
# 有两个品种的树苗
# 树苗的直径cm     生长天数

X = np.array([
    [1.0, 100],
    [1.1, 200],
    [0.9, 150],
    [0.2, 190],
    [1.0, 100],
    [1.1, 200],
    [0.7, 150],
    [0.2, 190],
    [2.1, 250],
    [1.8, 220],
    [2.2, 290],
    [1.9, 270],
    [2.1, 390],
    [1.8, 220],
    [2.2, 258],
    [1.9, 360]
])
y = np.array([0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1])
```

In [3]:
```
plt.scatter(X[y == 0, 0], X[y == 0, 1], color='r')
plt.scatter(X[y == 1, 0], X[y == 1, 1], color='g')
plt.show()
```



In [4]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size
=0.25, seed=100)
y_predict = kNN_classify(X_train, y_train, X_test)
accuracy_score(y_test, y_predict)
```

Out[4]: 0.5

从上面的结果可知，knn预测出来的准确率非常低。 原因是 样本不同特征之间他们的量纲不一样，会严重地影响到机器学习的效果

为什么需要对数据进行标准化：

样本不同特征之间他们的量纲不一样，会严重地影响到机器学习的效果

如何对数据进行标准化：

将数据按照比例进行缩放，使之落入一个小的特定空间之内

0均值标准化：

使之落入一个均值为0，标准差为1的这样一个范围内

标准化并不会让数据的分布发生变化，但是坐标值变小了，去除了量纲对我们算法的影响

In [5]:
```
X[:, 0]
```

Out[5]:
```
array([1. , 1.1, 0.9, 0.2, 1. , 1.1, 0.7, 0.2, 2.1, 1.8, 2.2, 1.9,
2.1,
       1.8, 2.2, 1.9])
```

In [6]:
```
X[:, 0] = (X[:, 0] - np.mean(X[:, 0])) / np.std(X[:, 0])       # 进
行0均值标准化
```

In [7]:
```
X[:, 0]
```

Out[7]:
```
array([-0.57775121, -0.42865412, -0.72684829, -1.77052789, -0.5777
5121,
       -0.42865412, -1.02504246, -1.77052789,  1.06231674,  0.6150
2548,
        1.21141382,  0.76412256,  1.06231674,  0.61502548,  1.2114
1382,
        0.76412256])
```

In [8]:
```
np.mean(X[:, 0])
```

Out[8]:
```
9.71445146547012e-17
```

In [9]:
```
np.std(X[:, 0])
```

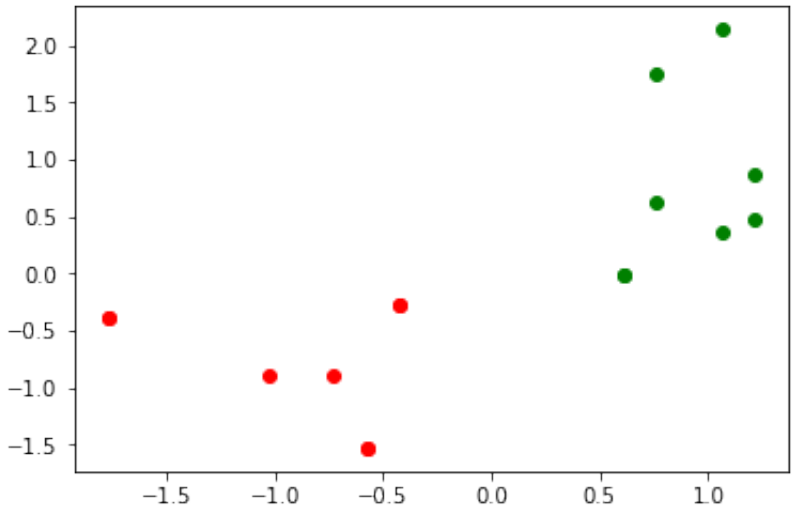
Out[9]:
```
0.9999999999999999
```

In [10]:
```
X[:, 1] = (X[:, 1] - np.mean(X[:, 1])) / np.std(X[:, 1])       # 进行0均值标准化
```

In [11]:
```
X[:, 1]
```

Out[11]:
```
array([-1.53655713, -0.26798571, -0.90227142, -0.39484285, -1.53655713,
       -0.26798571, -0.90227142, -0.39484285,  0.3663    , -0.01427143,
        0.87372856,  0.62001428,  2.14229998, -0.01427143,  0.46778571,
        1.76172855])
```

In [12]:
```
plt.scatter(X[y == 0, 0], X[y == 0, 1], color='r')
plt.scatter(X[y == 1, 0], X[y == 1, 1], color='g')
plt.show()
```



In [13]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.25, seed=100)
y_predict = kNN_classify(X_train, y_train, X_test)
accuracy_score(y_test, y_predict)
```

Out[13]:
```
1.0
```

In [17]:
```
from ML.preprocessing import StandardScaler
```

In [18]:
```
X = np.array([
    [1.0, 100],
    [1.1, 200],
    [0.9, 150],
    [0.2, 190],
    [1.0, 100],
    [1.1, 200],
    [0.7, 150],
    [0.2, 190],
    [2.1, 250],
    [1.8, 220],
    [2.2, 290],
    [1.9, 270],
    [2.1, 390],
    [1.8, 220],
    [2.2, 258],
    [1.9, 360]
])

standardScaler = StandardScaler()
standardScaler.fit(X)
```

Out[18]:
```
<ML.preprocessing.StandardScaler at 0x117ea7ac8>
```

In [20]:
```
X2 = standardScaler.transform(X)
```

In [21]:
```
X2
```

Out[21]:
```
array([[-0.57775121, -1.53655713],
       [-0.42865412, -0.26798571],
       [-0.72684829, -0.90227142],
       [-1.77052789, -0.39484285],
       [-0.57775121, -1.53655713],
       [-0.42865412, -0.26798571],
       [-1.02504246, -0.90227142],
       [-1.77052789, -0.39484285],
       [ 1.06231674,  0.3663    ],
       [ 0.61502548, -0.01427143],
       [ 1.21141382,  0.87372856],
       [ 0.76412256,  0.62001428],
       [ 1.06231674,  2.14229998],
       [ 0.61502548, -0.01427143],
       [ 1.21141382,  0.46778571],
       [ 0.76412256,  1.76172855]])
```

In [22]:
```
X_train, X_test, y_train, y_test = train_test_split(X2, y, test_siz
e=0.25, seed=100)
y_predict = kNN_classify(X_train, y_train, X_test)
accuracy_score(y_test, y_predict)
```

Out[22]:
```
1.0
```

数据标准化 --> 拆分训练集和测试集 --> KNN分类器进行预测 --> 计算预测准确率