K-Means对客户进行分类实战

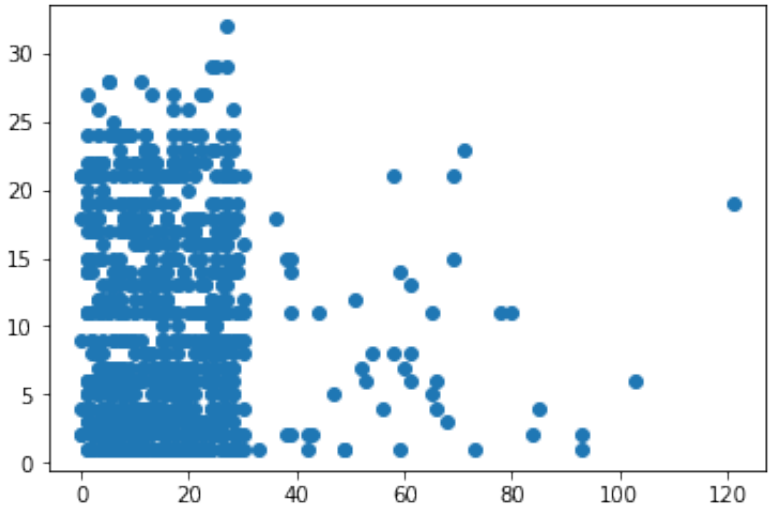
In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
```

In [2]:
```
data = np.loadtxt('consumption/x.txt')
```

In [3]:
```
data.shape
```

Out[3]: (940, 3)

In [4]:
```
plt.scatter(data[:, 0], data[:, 1])
plt.show()
```



1、标准化

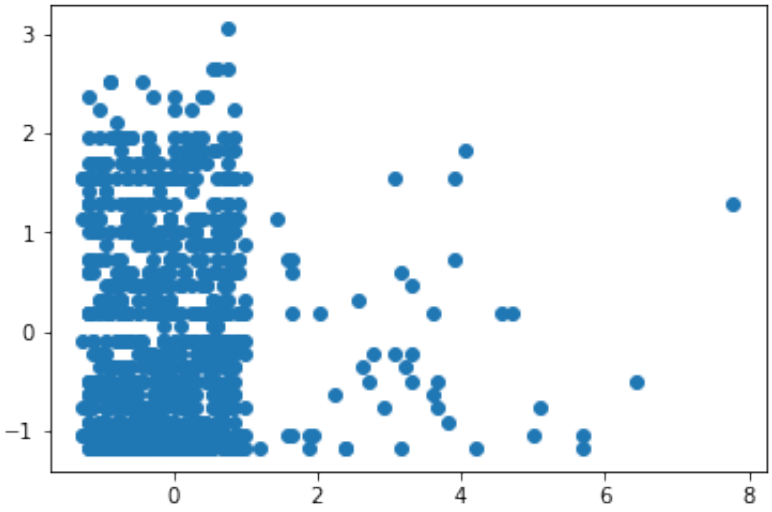
In [5]:
```
from ML.preprocessing import StandardScaler
```

In [6]:
```
standardScaler = StandardScaler()
standardScaler.fit(data)
X = standardScaler.transform(data)
```

In [7]:
```
X.shape
```

Out[7]: (940, 3)

In [8]:
```
plt.scatter(X[:, 0], X[:, 1])
plt.show()
```



2、确定K的取值，将样本分为 k 个类别（簇）

In [9]:
```
k = 3
center = np.zeros((k, X.shape[1]))
center
```

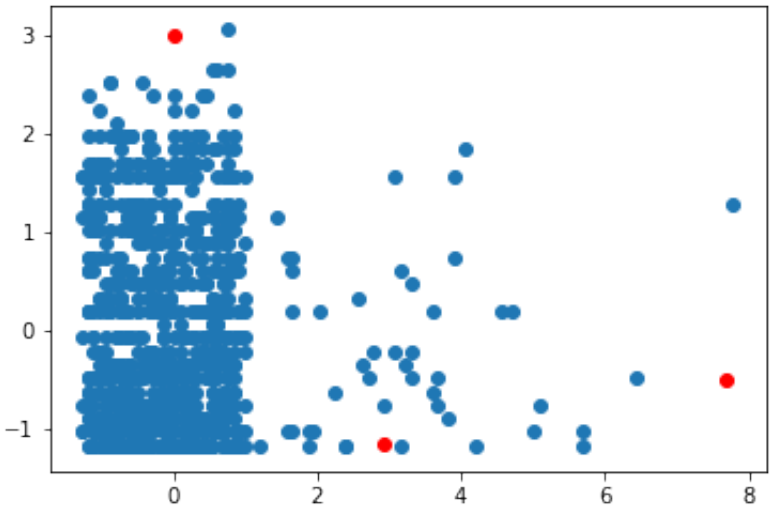
Out[9]:
```
array([[0., 0., 0.],
       [0., 0., 0.],
       [0., 0., 0.]])
```

3、随机初始化 k 个聚类中心（质心）

In [10]:
```
# c = min + rand(0, 1) * (max - min)
np.random.seed(601)
for i in range(center.shape[1]):
    max_val = X[:, i].max()
    min_val = X[:, i].min()
    center[:, i] = np.ones(k) * min_val + np.random.rand(k) * (max_
val - min_val)
center
```

Out[10]:
```
array([[ 1.75875622e-03,  2.99365779e+00,  5.45192484e+00],
       [ 7.67019012e+00, -5.02385500e-01,  2.94442909e+00],
       [ 2.94052906e+00, -1.15924657e+00,  6.09560424e+00]])
```

In [11]:
```
plt.scatter(X[:, 0], X[:, 1])
plt.scatter(center[:, 0], center[:, 1], color='r')
plt.show()
```



4、计算各特征的点到聚类中心的距离

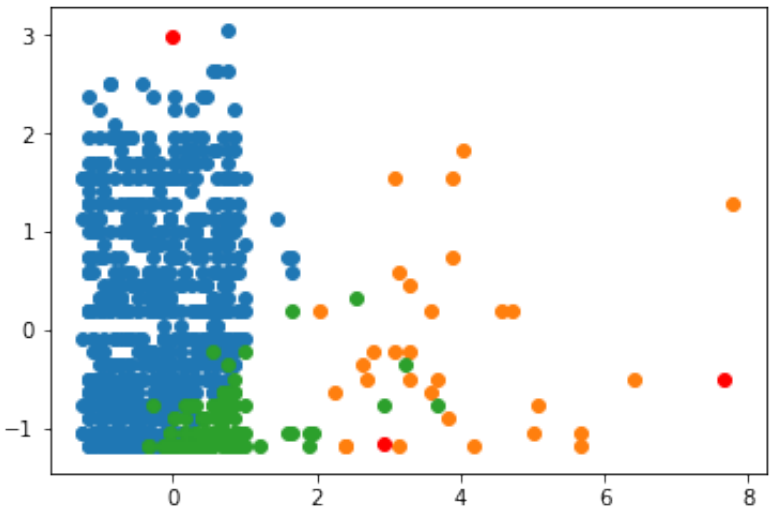
In [12]:
```
def distance(a, b):
    return np.sum(np.abs(a - b) ** 2)
```

In [13]:
```
label = []
for i in range(X.shape[0]):
    temp = []
    for j in range(k):
        temp.append(distance(X[i, :], center[j, :]))
    label.append(np.argsort(temp)[0])
label = np.array(label)
```

In [14]:
```
label.shape
```

Out[14]: (940,)

In [15]:
```
plt.scatter(X[label == 0, 0], X[label == 0, 1])
plt.scatter(X[label == 1, 0], X[label == 1, 1])
plt.scatter(X[label == 2, 0], X[label == 2, 1])
plt.scatter(center[:, 0], center[:, 1], color='r')
plt.show()
```



5、调整聚类中心的位置

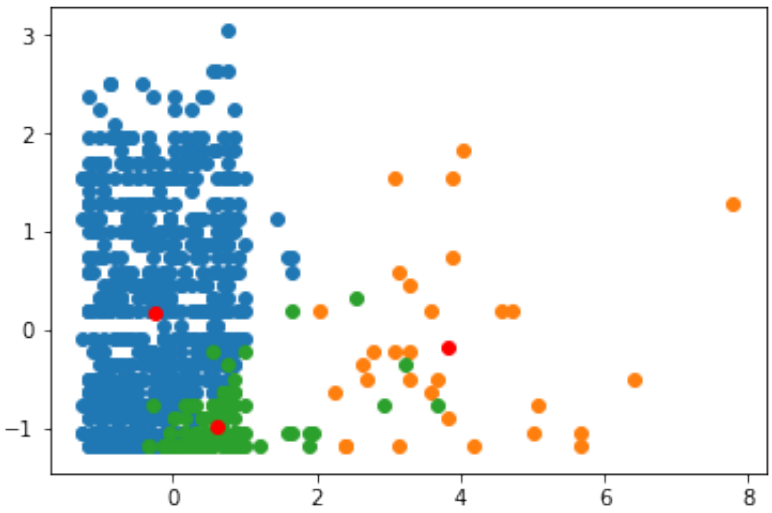
In [16]:
```
def new_center(X, label, k):
    center = np.zeros((k, X.shape[1]))
    for col in range(X.shape[1]):
        for i in range(k):
            center[i, col] = X[label == i, col].mean()
    return center
```

In [17]:
```
center = new_center(X, label, k)
```

In [18]:
```
center
```

Out[18]:
```
array([[-0.25321307,  0.17496107, -0.00943551],
       [ 3.84221882, -0.17061919, -0.00477222],
       [ 0.61263149, -0.98365544,  0.05619971]])
```

In [19]:
```
plt.scatter(X[label == 0, 0], X[label == 0, 1])
plt.scatter(X[label == 1, 0], X[label == 1, 1])
plt.scatter(X[label == 2, 0], X[label == 2, 1])
plt.scatter(center[:, 0], center[:, 1], color='r')
plt.show()
```

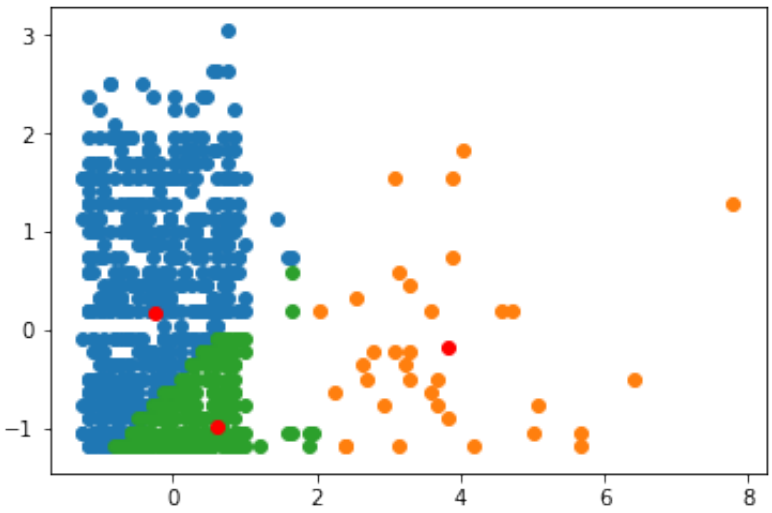


6、循环第 4、5 步

In [20]:
```
def kmeans(X, k, center):
    label = []
    for i in range(X.shape[0]):
        temp = []
        for j in range(k):
            temp.append(distance(X[i, :], center[j, :]))
        label.append(np.argsort(temp)[0])
    return np.array(label)
```

In [21]:
```
label = kmeans(X, k, center)
```

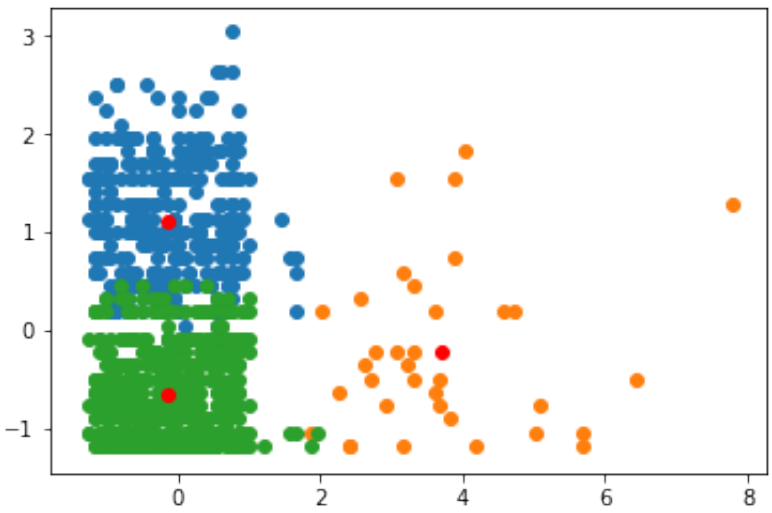
In [22]:
```
plt.scatter(X[label == 0, 0], X[label == 0, 1])
plt.scatter(X[label == 1, 0], X[label == 1, 1])
plt.scatter(X[label == 2, 0], X[label == 2, 1])
plt.scatter(center[:, 0], center[:, 1], color='r')
plt.show()
```



In [23]:
```
while True:
    c = new_center(X, label, k)
    label = kmeans(X, k, c)

    if (c == center).all():
        break
    else:
        center = c
```

In [24]:
```
plt.scatter(X[label == 0, 0], X[label == 0, 1])
plt.scatter(X[label == 1, 0], X[label == 1, 1])
plt.scatter(X[label == 2, 0], X[label == 2, 1])
plt.scatter(center[:, 0], center[:, 1], color='r')
plt.show()
```



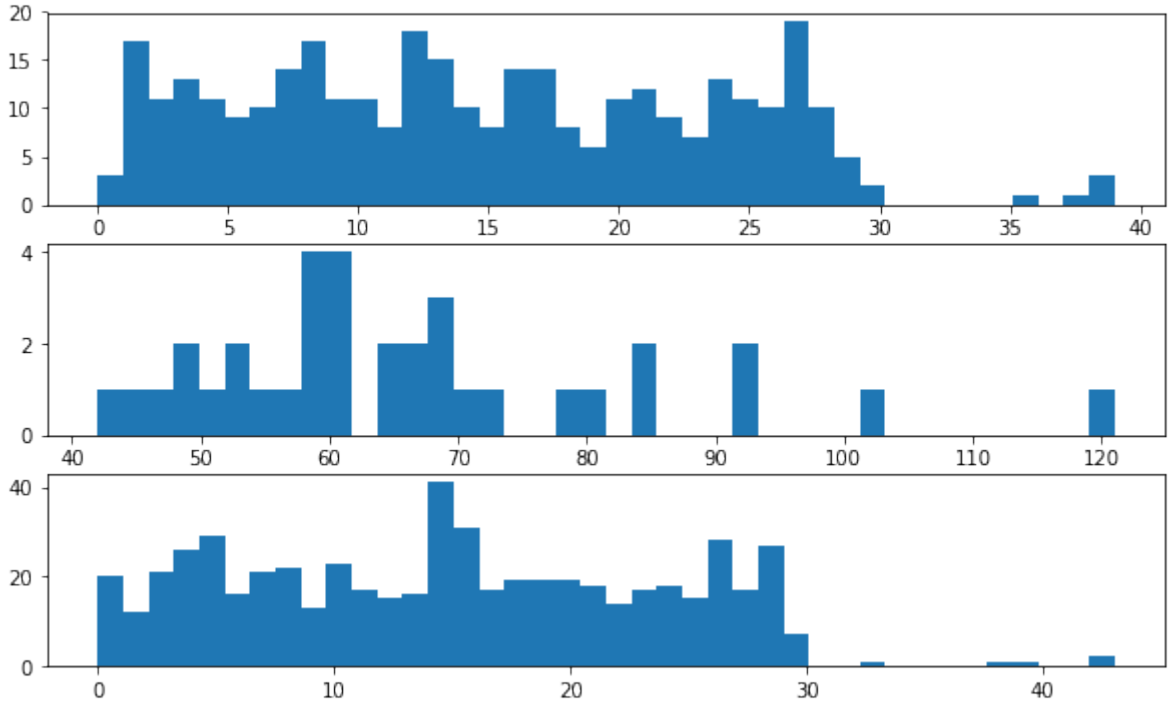
In [25]:
```
plt.figure(figsize = (10, 6))

plt.subplot(3, 1, 1)
plt.hist(data[label==0, 0], bins=40)

plt.subplot(3, 1, 2)
plt.hist(data[label==1, 0], bins=40)

plt.subplot(3, 1, 3)
plt.hist(data[label==2, 0], bins=40)

plt.show()
```



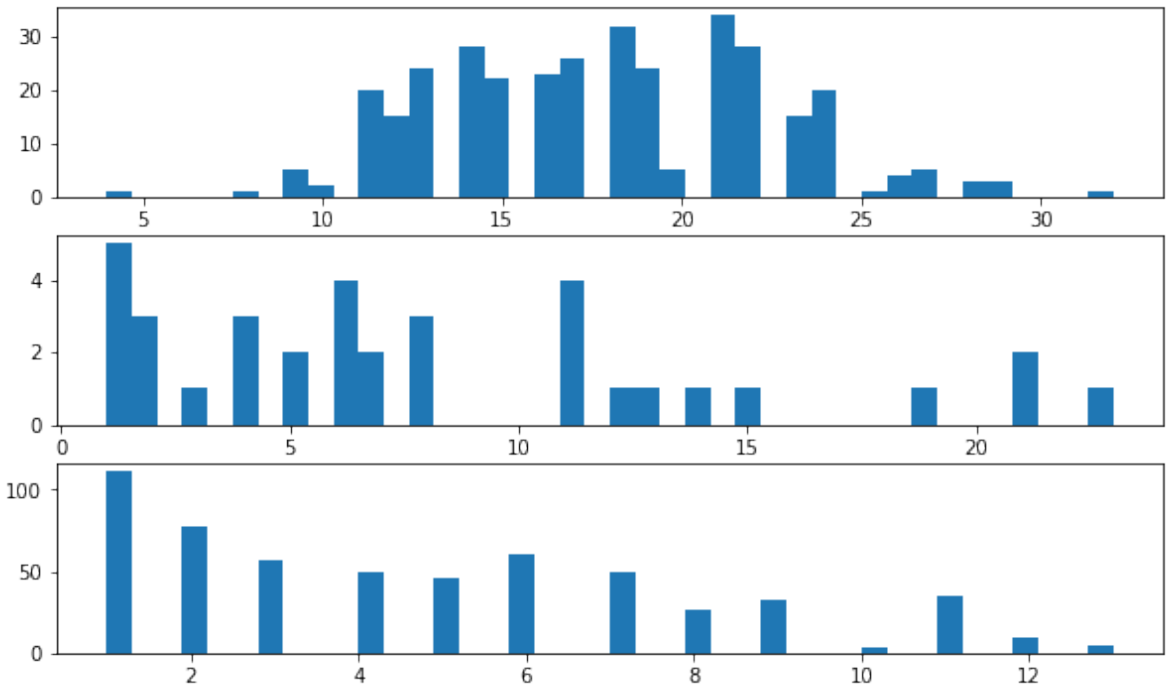
In [26]:
```
plt.figure(figsize = (10, 6))

plt.subplot(3, 1, 1)
plt.hist(data[label==0, 1], bins=40)

plt.subplot(3, 1, 2)
plt.hist(data[label==1, 1], bins=40)

plt.subplot(3, 1, 3)
plt.hist(data[label==2, 1], bins=40)

plt.show()
```



In [27]:
```
plt.figure(figsize = (10, 6))

plt.subplot(3, 1, 1)
plt.hist(data[label==0, 2], bins=40)

plt.subplot(3, 1, 2)
plt.hist(data[label==1, 2], bins=40)

plt.subplot(3, 1, 3)
plt.hist(data[label==2, 2], bins=40)

plt.show()
```