实验一：特征处理

特征处理包括数据预处理和特征工程。

数据处理含了数据清洗和数据采样。

数据清洗：1.检测异常样本2.缺省值处理：①缺省值极多②非连续特征缺省值适中③连续特征缺省值适中④缺省较少

数据采样：1. 从负样本中抽取部分样本出来和正样本结合

（欠采样，容易造成信息损失）

2 . 正样本重复若干次

（上采样，保留的数据信息但是有可能放大其噪声数据）。

3. 代价敏感学习Cost Sensitive Learning

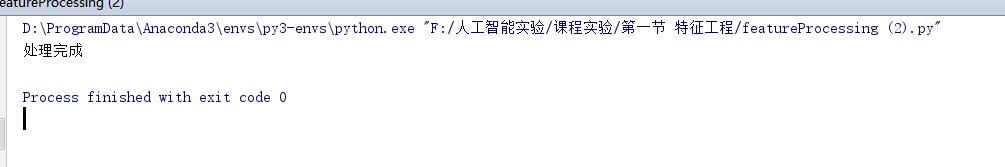
4. SMOTE即合成少数类过采样技术

代码：

**import** numpy **as** np  
**import** xlrd *#引入xlrd模块***import** xlwt *#引入xlwd模块***def** open\_excel(file):  
 **try**:  
 data = xlrd.open\_workbook(file) *#打开excel文件* **return** data  
 **except** Exception **as** e:  
 print(str(e))  
  
**def** split\_age\_range(age):  
 *"""  
 将特征值年龄进行离散化为8个特征值* **:param** *age: 年龄区间值* **:return***: 离散化后的特征  
 """* **if** age == 0:  
 **return** [1,0,0,0,0,0,0,0,0]  
 **elif** age == 1:  
 **return** [0,1,0,0,0,0,0,0,0]  
 **elif** age == 2:  
 **return** [0,0,1,0,0,0,0,0,0]  
 **elif** age == 3:  
 **return** [0,0,0,1,0,0,0,0,0]  
 **elif** age == 4:  
 **return** [0,0,0,0,1,0,0,0,0]  
 **elif** age == 5:  
 **return** [0,0,0,0,0,1,0,0,0]  
 **elif** age == 6:  
 **return** [0,0,0,0,0,0,1,0,0]  
 **elif** age == 7 **or** age == 8:  
 **return** [0,0,0,0,0,0,0,1,0]  
 *# elif age == 8:  
 # return [0,0,0,0,0,0,0,0,1]***def** split\_gender(gender):  
 *"""  
 将特征值性别进行离散化* **:param** *gender:* **:return***: 返回离散化的特征  
 """* **if** gender == 0:  
 **return** [1,0,0]  
 **elif** gender == 1:  
 **return** [0,1,0]  
 **elif** gender == 2:  
 **return** [0,0,1]  
  
**def** split\_log(Log):  
 *"""  
 分割数据文件中的Log数据* **:param** *Log: Log数据* **:return***: 处理后的特征值  
 """* items = Log.strip().split(**'#'**)  
 purchase = 0;total = 0  
 click = 0;add\_to\_card = 0;add\_to\_favourite = 0  
 **for** i **in** range(len(items)):  
 total += 1  
 item = items[i].strip().split(**':'**)  
 **if** item[4] == **'2'**:  
 purchase += 1  
 **if** item[4] == **'1'**:  
 add\_to\_card += 1  
 **if** item[4] == **'3'**:  
 add\_to\_favourite += 1  
 **return** [float(total),float(round(purchase/total,3)),float(add\_to\_card),float(add\_to\_favourite)]  
  
**def** loadDataSet(path, training\_sample,colnameindex=0,by\_name=**u'Sheet1'**):  
 *"""  
 加载数据* **:param** *path: 数据文件存放路径* **:param** *training\_sample: 数据文件名* **:param** *colnameindex: 文件列名下标* **:param** *by\_name: 表名* **:return***: 数据集和类别标签  
 """* dataMat = [];  
 labelMat = [] *# 定义列表* filename = path + training\_sample  
 data = open\_excel(filename) *#获取文件* table = data.sheet\_by\_name(by\_name) *# 获取Sheet1* nrows = table.nrows *# 拿到总共行数* colnames = table.row\_values(colnameindex) *# 某一行数据 ['user\_id', 'age\_range', 'gender', 'merchant\_id','label']* **for** rownum **in** range(1, nrows): *# 也就是从Excel第二行开始，第一行表头不算* row = table.row\_values(rownum)  
 **if** row[1] == **'' or** row[2] == **'' or** row[5] == **''**:  
 **continue  
 if** row:  
 app = [] *#定义列表* app = split\_age\_range(row[1])+split\_gender(row[2]) + split\_log(row[5]) *# 将Log转化为特征值* dataMat.append(app)   
 labelMat.append(float(row[4])) *# 获取类别标签* **return** dataMat, labelMat  
  
**def** main():  
 *"""  
 主函数* **:return***: null  
 """* wb = xlwt.Workbook()  
 ws = wb.add\_sheet(**'sheet1'**,cell\_overwrite\_ok=**True**)  
 path = **"F:\\ai2\\"** training\_sample = **'train\_data.xls'** *# 训练数据文件* trainingSet, trainingLabels = loadDataSet(path, training\_sample) *# 取训练数据  
 # print(len(trainingSet))* num = len(trainingSet)  
 **for** i **in** range(num):  
 **for** j **in** range(16):  
 ws.write(i,j,trainingSet[i][j])  
 ws.write(i,j+1,trainingLabels[i])  
 wb.save(**'F:\\featuredata.xls'**)  
 print(**"处理完成"**)  
  
**if** \_\_name\_\_ == **'\_\_main\_\_'**:  
 **"""  
 程序入口  
 """** main()

（2）**import** numpy **as** np  
**import** xlrd  
**import** xlwt  
*# from sklearn import preprocessing # 进行标准化数据时，需要引入这个包***from** sklearn.model\_selection **import** train\_test\_split  
  
**def** open\_excel(file):  
 **try**:  
 data = xlrd.open\_workbook(file)  
 **return** data  
 **except** Exception **as** e:  
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 **return** [0,0,0,0,0,1,0,0,0]  
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 total += 1  
 item = items[i].strip().split(**':'**)  
 **if** item[4] == **'2'**:  
 purchase += 1  
 **if** item[4] == **'1'**:  
 add\_to\_card += 1  
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 """* wb = xlwt.Workbook()  
 ws = wb.add\_sheet(**'sheet1'**,cell\_overwrite\_ok=**True**)  
 path = **"F:\\ai2\\"** training\_sample = **'新建 Microsoft Excel 工作表.xls'** *# 训练数据文件* trainingSet, trainingLabels = loadDataSet(path, training\_sample) *# 取训练数据  
 # print(len(trainingSet))* num = len(trainingSet)  
 **for** i **in** range(num):  
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 ws.write(i,j,trainingSet[i][j])  
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 print(**"处理完成"**)  
  
**if** \_\_name\_\_ == **'\_\_main\_\_'**:  
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 程序入口  
 """** main()

运行结果：

第一个python：

第二个python：

