@TOC

环境准备与基础知识

- Jupyter notebook

  > Jupyter Notebook是一块所见即所得的画布，通过在浏览器上编辑代码，让开发人员实现展示与快速迭代的利器。
  >
  > 更多内容参考：https://www.jianshu.com/p/91365f343585

- 完成任务回顾
  - 将 任务 分3块
    1. 需求，目标
    2. 确定方法，明确步骤，分步骤执行
    3. 输出结果与调优
  - 善用工具
    - 如Bob（翻译插件）、Dash（API文档）
  - 勤于总结
    - pd、np常用操作等
  - 积极沟通

第一次机器学习内容

Lab02 - Decision Tree - I

1、案例：泰坦尼克号幸存者预测

案例结构：

1. 引入依赖

```
# 数据分析和准备
import pandas as pd
import numpy as np
import random as rnd
```

```
# 可视化
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline

# 机器学习
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn import metrics
```

2. 读取数据（训练数据和测试数据）

```
# 读取数据文件到dateframe
train_df = pd.read_csv('train.csv')

# 查看前5行
train_df.head()

# 查看数据类型和缺失值
train_df.info()
```

3. 人为分析数据（数据概况、缺失值等）

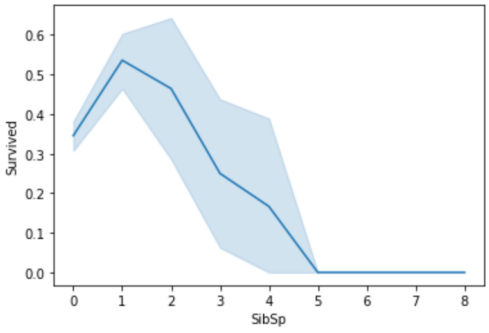
```
# 输出表头信息
print(train_df.columns.values.tolist())

# 根据百分比分布查看数据
train_df.describe(percentiles=[.1, .2,.3,.4, .6, .7, .8, .9, .95,
.98,.99])

# 查看连续特征的数据列分析
train_df.describe()

# 查看分类特征的数据列分析
train_df.describe(include=['O'])
```

4. 数据分析，清洗数据（相关性分析，缺失值填充等）

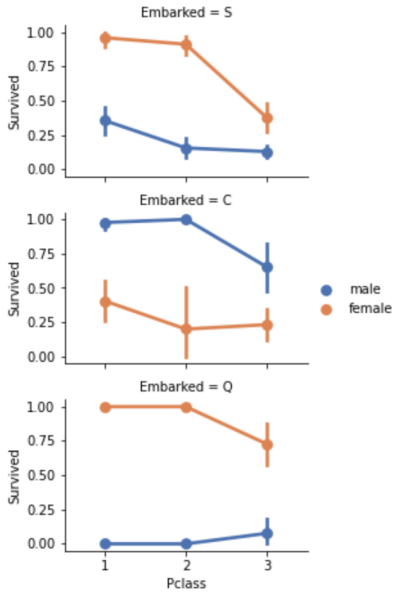
```
# 众数填充空值
df['Embarked'].fillna(df['Embarked'].mode(dropna=True)[0],
inplace=True)

# 数据表格 数据替换（数字编码分类特征）
num_encode = {
    'Sex': {'male': 0, "female": 1},
    'Embarked': {'S': 0, 'Q': 1, 'C': 2 }
}
df.replace(num_encode, inplace=True)
```

5. 可视化输出，方便分析

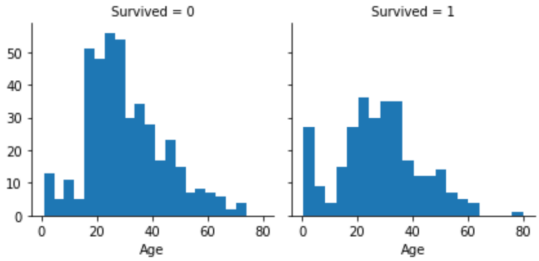
```
# 折线图
sns.lineplot(x='SibSp', y='Survived', data=train_df)
```




```
# 格点图
grid = sns.FacetGrid(train_df, row='Embarked', height=2.2,
aspect=1.6)
grid.map(sns.pointplot, 'Pclass', 'Survived', 'Sex',
palette='deep')
grid.add_legend()
```




```
# 柱状图
g = sns.FacetGrid(train_df, col='Survived')
g.map(plt.hist, 'Age', bins=20)
```



6. 建模、预测和评价

```
# 切分数据集，用于训练和验证
x_train, x_test, y_train, y_test = train_test_split(X, y,
test_size=0.3)

# 决策树建模和训练
tree = DecisionTreeClassifier(criterion='entropy')
tree.fit(x_train, y_train)

# 决策树预测
y_pred = tree.predict(x_test)

# 评价，输出准确度
print("Accuracy:", metrics.accuracy_score(y_test, y_pred))
```

2、任务：气缸带数据集band type预测

任务结构：

1. 引入依赖包

   依然使用决策树算法，引入包同上案例

2. 导入数据

```
# 指定列名和缺失值导入数据到dataframe
names = ['c1', 'c2', 'c3']
missing_values = ["?","nan"]
train_df =
pd.read_csv('bands_init.data',names=names,na_values=missing_valu
es)
```

3. 清洗数据

```
# 遍历替换
# 把df中的 ? 替换成 'nan'
# 把df中 str 类型的值全部转换成小写
temp = 'aa22'
feature_list = train_df.columns.tolist()
for index in train_df.index:
    for feature in feature_list:
        if type(train_df.loc[index, feature]) == type(temp):
            train_df.loc[index, feature] = train_df.loc[index,
feature].lower()
        if train_df.loc[index, feature] == '?':
            # print(train_df.loc[index, feature])
            train_df.loc[index, feature] = np.nan
```

```
# 列类型转换
# 从20列到39列 将列属性转换成float类型
i=20
while(i<39):
    count = 0
    for row in train_df[feature_list[i]]:
        try:
            float(row)
        except ValueError:
            train_df.loc[count,feature_list[i]] = np.nan
            pass
        count=count+1
```

```
 train_df[feature_list[i]]=train_df[feature_list[i]].astype(np.float64)
    # 输出转换过的列名
    print(feature_list[i])
    i=i+1
```

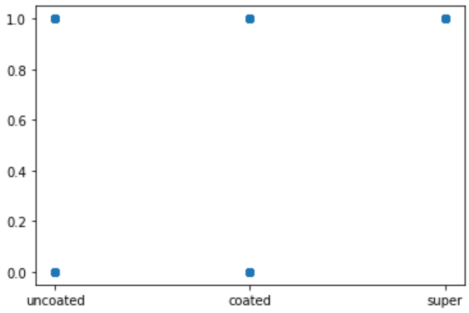
4. 数据分析

   同上案例

5. 数据可视化

   > 画图时，当数据有空值会导致画图失败。
   >
   > 解决办法：先填充空值再画图分析。

```
# 散点图
x = train_df['paper type']
y = train_df['band type']
color = ['r','y','k','g','m']
plt.scatter(x, y)
plt.show()
```



6. 再次清洗数据

```
# 删除目标值为空的数据（错误数据（如出现错行现象））
for index in range(train_df.shape[0]):
    try:
        if np.isnan(train_df['band type'][index]):
            train_df=train_df.drop([index])
    except:
        pass
```

7. 准备数据

> 可以把encode的map定义大些，X可以从中选取几个训练，方便调整训练模型。

```
# 用大map数据替换
encode = {
    'grain screened':{'yes':0,'no':1},
    'proof on ctd ink':{'yes':0,'no':1},
    'blade mfg':{'uddeholm':0,'benton':1},
    'paper type':{'coated':0,'uncoated':1,'super':2},
    'ink type':{'coated':0,'uncoated':1,'cover':2},
    'direct steam':{'yes':0,'no':1},
    'type on cylinder':{'yes':0,'no':1},
    'plating tank':{'1911':0,'1910':1},
    'solvent type':{'naptha':0,'line':1,'xylol':2},
    'press type':
{'motter70':0,'motter94':1,'albert70':2,'woodhoe70':3},
    'paper mill location':
{'scandanavian':0,'canadian':1,'northus':2,'mideuropean':3,'sout
hus':4}
}
train_df.replace(encode, inplace=True)

# 选取不同列作为训练数据集，之后进行训练
X = train_df[['grain screened','blade mfg','direct steam','paper
type', 'ink type','press type','solvent type']]
# X = train_df[['grain screened','blade mfg','direct
steam','type on cylinder','plating tank']]
y = train_df['band type']
```

8. 建模、预测和评价

   同上