Data Preparation

Data preprocessing

Connect the data, Duplicates, Missing values….

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Data Preparation

- Data Preparation is a key step for data analysis.
- Data Preparation is vital to good machine learning performance.

- Garbage in garbage out
  - ➔data need to be well-prepared, well cleaned up,

Data Preparation Steps

- Exploration to understand data problems
  - Remove duplicates.
  - Treat missing values.
  - Treat errors and outliers,
  - Scale the features
  - Split the dataset,
  - Visualization to check results

Duplicates

- Duplicate case are overweighed and bias.
- Identity duplicate cases
  - By unique ID
  - By Value – with caution!
- Removal strategies
  - Keep most recent (or oldest)
  - Keep first
  - Keep last

Missing Values

- Use exploration to detect
- How are missing values coded?
  - NULL
  - 9999, 0 , NA, ?.....
- Treatment strategies
  - Remove column with mostly missing values
  - If few rows remove
  - Forward or backward fill
  - Impute: mean, median…

Errors and Outliers

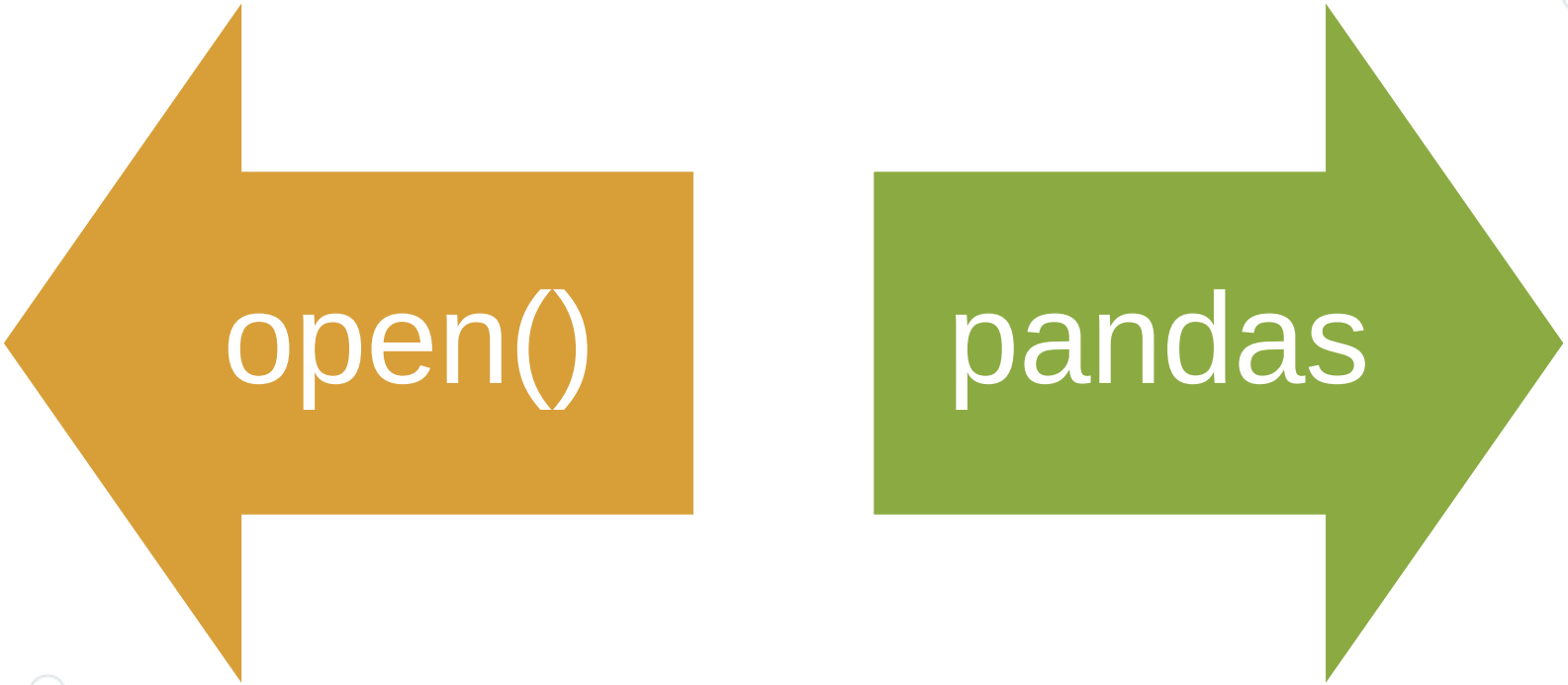
- Use exploration to detect
  - Erroneous values ?
  - Important data ?
- Identify cases with domain knowledge
  - Statistics
  - Visualization
- Treatment strategies
  - Limit to min-max range
  - Same as missing values

- File reading and writing
- Missing values
- Duplicate values
- Data corresponding\Replace\bin
- Among two Data tables

File reading and writing

File reading and writing

- File reading and writing



File reading and writing

- 檔案開啟 Open() the file
- Using open()
  - f = open('name', 'model')
- model
  - r　read 讀取(檔案需存在)
  - w　write 新建檔案寫入(檔案可不存在，若存在則清空)
  - a　append 資料附加到舊檔案後面(游標指在EOF)

File reading and writing

- read()
  - f.read()
  - f.read(size)
    - indicate the size
  - f.readline()
    - Read one line and end with \n
  - f.readlines()
    - Read each line into an item in a list

File reading and writing

- 檔案寫入 writing a file
- open()...write()
  - f = open('name', 'a')
  - f.write("write something....")
  - f.close()

File reading and writing

- Via pandas and read as a Dataframe
  - import pandas as pd
  - df = pd.read_csv("file name.csv")
  - df.to_csv("file name.csv")
    - In Chinese, the coding error…
    - df = pd.read_csv("檔名.csv", encoding='big5')

File reading and writing

Format Type	Data Description	Reader	Writer
text	CSV	read_csv	to_csv
text	JSON	read_json	to_json
text	HTML	read_html	to_html
text	Local clipboard	read_clipboard	to_clipboard
binary	MS Excel	read_excel	to_excel
binary	HDF5 Format	read_hdf	to_hdf
binary	Feather Format	read_feather	to_feather
binary	Msgpack	read_msgpack	to_msgpack
binary	Stata	read_stata	to_stata
binary	SAS	read_sas	
binary	Python Pickle Format	read_pickle	to_pickle
SQL	SQL	read_sql	to_sql
SQL	Google Big Query	read_gbq	to_gbq

http://pandas.pydata.org/pandas-docs/stable/io.html

Deal with Missing values

Deal with Missing values

- First determine if there is missing data NaN
- and the distribution of missing values
  - df1.isnull()
  - df1.isnull().sum()

Deal with Missing values

- Method 1:
  - 是將 NaN 的值用其他值代替, 比如代替成 0
    - df2 = df1.fillna(value=0)
    - df2

Deal with Missing values

- Method 2:
  - 將 NaN 值刪除
    - df3 = df1.dropna()
    - df3

- *#其他用法*
- df1.dropna(subset=['欄位名稱']) *#針對特定欄位名稱*
- df1.dropna(axis=0) *# 0: 對資料列進行操作; 1: 對該欄位進行操作*
- df1.dropna(how='any') *#'any': 存在 NaN 就 drop 掉; 'all': 全是 NaN 才 drop*
- df1.dropna(thresh=3) *#至少要有thresh個非NaN值*

Deal with Missing values

- Method 3:
  - 差補法 (使用sklearn)

```
from sklearn.preprocessing import Imputer

imr = Imputer(missing_values='NaN', strategy=_____, axis=0)

imr = imr.fit(df1)

imputed_data = imr.transform(df1.values)

imputed_data

# strategy='mean', 'median', 'most_frequent'
```

Remove the duplicates

Remove the duplicates

- Check first
  - df.duplicated()

- Remove the duplicates
  - df.drop_duplicates()
    - 針對特定欄位：可加上欄位名稱與保留順序
    - #例如：df.drop_duplicates(['col1'], keep='last')

Data map/replace/bin

map

- 新建一個字典
  - {key01 : value01,
    key02 : value02,.....}
  - 用字典裡的value取代原本的key(原本資料表的值)
- 在特定欄位用map()執行
  - df["欄位"].map({dict})
- 例如：將性別欄位(女、男)變成(0、1)
  - gender_to_boolean = {"female":0,"male":1} #字典
  - df['gender'].map(sex_to_boolean)

replace

- 取代請愛用replace()
- df.replace(原本的值 , 新的值)
  - df['col2'].replace("-",0)
- df.replace(也可以用字典方式)
  - df.replace({"NULL":0 , "-":-1})

bin

- Two list
  - bins
    - 分箱相的間隔點list
  - labels
    - 各區間對應的labels

  - bins = [0, 60, 70, 80, 90, 100]
  - labels = ['E','D','C','B','A']
  - pd.cut(df['score'],bins, right=False, labels=labels)

Merge two dataframe

Concatenating dataframes

- *#concat*
- import pandas as pd
- import numpy as np

- *#three dfs*
- df1 = pd.DataFrame(np.ones((3,4))*0, columns=['a','b','c','d'])
- df2 = pd.DataFrame(np.ones((3,4))*1, columns=['a','b','c','d'])
- df3 = pd.DataFrame(np.ones((3,4))*2, columns=['a','b','c','d'])

- *#concatenating*
- res = pd.concat([df1, df2, df3], axis=0, ignore_index=True)

Merging dataframes

```
# merge
import pandas as pd

left = pd.DataFrame({'key': ['K0', 'K1', 'K2', 'K3'],
                     'A': ['A0', 'A1', 'A2', 'A3'],
                     'B': ['B0', 'B1', 'B2', 'B3']})
right = pd.DataFrame({'key': ['K1', 'K2', 'K3', 'K4'],
                      'C': ['C0', 'C1', 'C2', 'C3'],
                      'D': ['D0', 'D1', 'D2', 'D3']})
res = pd.merge(left, right, on='key')
```

Merging dataframes

```
# merge
import pandas as pd

left = pd.DataFrame({'key1': ['K0', 'K1', 'K1', 'K2'],
                     'key2': ['K0', 'K1', 'K0', 'K1'],
                     'A': ['A0', 'A1', 'A2', 'A3'],  'B': ['B0', 'B1', 'B2', 'B3']})
right = pd.DataFrame({'key1': ['K0', 'K1', 'K1', 'K2'],
                      'key2': ['K0', 'K0', 'K0', 'K0'],
                      'C': ['C0', 'C1', 'C2', 'C3'],   'D': ['D0', 'D1', 'D2', 'D3']})

# join by key with different name with ['left', 'right', 'outer', 'inner']
res = pd.merge(left, right, on=['key1', 'key2'], how='inner')
```

Q & A

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