大数据分析实践
课程实验报告

实验项目-数据质量实践

专业班级：22级公信

学　　号：202200120100

姓　　名：徐瑞良

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目　录

实验 2 数据质量实践

2.1 实验目标

本次实验主要围绕宝可梦数据集进行分析，考察在拿到数据后如何对现有的数据进行预处理清洗操作，建立起对于脏数据、缺失数据等异常情况的一套完整流程的认识。

2.2 实验环境

python3.9，jupyter notebook

2.3 数据集

Pokeman Dataset：721 Pokemon, including their number, name, first and second type, and basic stats: HP, Attack, Defense, Special Attack, Special Defense, and Speed

数据集地址：http://storage.amesholland.xyz/Pokemon.csv

2.4 实验步骤

2.4.1 配置环境与加载数据集

```
import chardet
import pandas as pd
from pandas import DataFrame
import numpy as np
import matplotlib.pyplot as plt

with open('D:/大数据分析实践 实验内容/Pokemon.csv', 'rb') as f:
    result = chardet.detect(f.read())

df = pd.read_csv('D:/大数据分析实践 实验内容/Pokemon.csv', encoding=result['encoding'])
df
```

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	L
0	1	Bulbasaur	Grass	Poison	318	45	49	49	65	65	45	1	
1	2	Ivysaur	Grass	Poison	405	60	62	63	80	80	60	1	
2	3	Venusaur	Grass	Poison	525	80	82	83	100	100	80	1	
3	3	VenusaurMega Venusaur	Grass	Poison	625	80	100	123	122	120	80	1	
4	4	Charmander	Fire	NaN	309	39	52	43	60	50	65	1	
...	...	...	...	...	...	...	...	...	...	...	...	...	
805	721	Volcanion	Fire	Water	600	80	110	120	130	90	70	6	
806	undefined	undefined	undefined	undefined	undefined	undefined	undefined	undefined	undefined	undefined	undefined	undefined	
807	undefined	undefined	undefined	undefined	undefined	undefined	undefined	undefined	undefined	undefined	undefined	undefined	
808	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
809	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	

810 rows × 13 columns

2.4.2 实验步骤

①数据集存在的部分问题：最后两行数据无意义，可直接删去

```
df=df.iloc[:-4]
df.tail()
```

实际实验中发现数据集最后四行都无意义，将其都删除。结果如下：

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
801	719	Diancie	Rock	Fairy	600	50	100	150	100	150	50	6	TRUE
802	719	DiancieMega Diancie	Rock	Fairy	700	50	160	110	160	110	110	6	TRUE
803	720	HoopaHoopa Confined	Psychic	Ghost	600	80	110	60	150	130	70	6	TRUE
804	720	HoopaHoopa Unbound	Psychic	Dark	680	80	160	60	170	130	80	6	TRUE
805	721	Volcanion	Fire	Water	600	80	110	120	130	90	70	6	TRUE

②type2 存在异常的数值取值，可清空

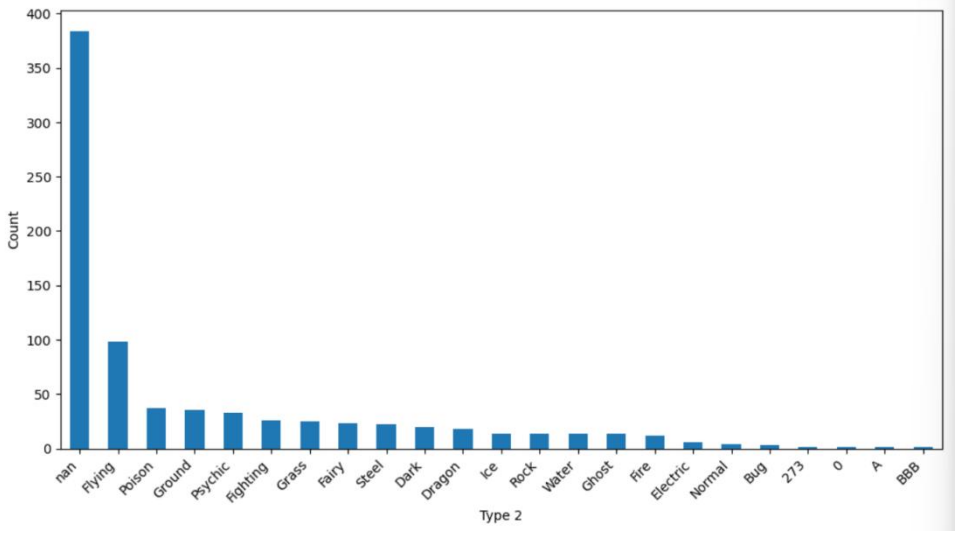
参考实验指导书内容，绘制了一个柱状图，用以统计 type2 中所有的取值

```
type2_counts = df['Type 2'].value_counts(dropna=False)

plt.figure(figsize=(12, 6))
type2_counts.plot(kind='bar')

plt.xlabel('Type 2')
plt.ylabel('Count')
plt.xticks(rotation=45, ha='right')

plt.show()
```



将异常值['273', '0', 'A', 'BBB']标注并删除

```
target_contents = ['273', '0', 'A', 'BBB']
df[df['Type 2'].isin(target_contents)]
```

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
34	27	Sandshrew	Ground	0	300	50	75	85	20	30	40	1	FALSE
39	32	Nidoranâ™?Poison	NaN	273	46	57	40	40	40	50	1	FALSE	NaN
117	107	Hitmonchan	Fighting	A	455	50	105	79	35	110	76	1	FALSE
428	382	KyogrePrimal Kyogre	Water	BBB	770	100	150	90	180	160	90	3	TRUE

```
df = df[~df['Type 2'].isin(target_contents)]
df
```

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
0	1	Bulbasaur	Grass	Poison	318	45	49	49	65	65	45	1	FALSE
1	2	Ivysaur	Grass	Poison	405	60	62	63	80	80	60	1	FALSE
2	3	Venusaur	Grass	Poison	525	80	82	83	100	100	80	1	FALSE
3	3	VenusaurMega Venusaur	Grass	Poison	625	80	100	123	122	120	80	1	FALSE
4	4	Charmander	Fire	NaN	309	39	52	43	60	50	65	1	FALSE
...	...	...	...	...	...	...	...	...	...	...	...	...	...
801	719	Diancie	Rock	Fairy	600	50	100	150	100	150	50	6	TRUE
802	719	DiancieMega Diancie	Rock	Fairy	700	50	160	110	160	110	110	6	TRUE
803	720	HoopaHoopa Confined	Psychic	Ghost	600	80	110	60	150	130	70	6	TRUE
804	720	HoopaHoopa Unbound	Psychic	Dark	680	80	160	60	170	130	80	6	TRUE
805	721	Volcanion	Fire	Water	600	80	110	120	130	90	70	6	TRUE

802 rows × 13 columns

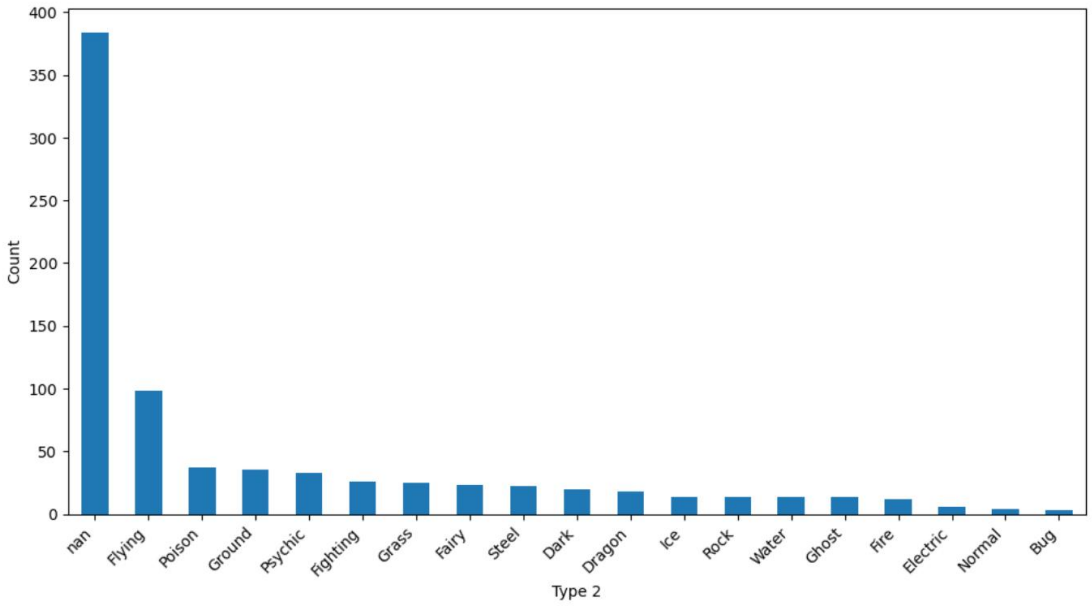
绘制柱状图显示数据删除更新后的结果

```
type2_counts_cleaned = df['Type 2'].value_counts(dropna=False)

plt.figure(figsize=(12, 6))
type2_counts_cleaned.plot(kind='bar')

plt.xlabel('Type 2')
plt.ylabel('Count')
plt.xticks(rotation=45, ha='right')

plt.show()
```



③数据集中存在重复值

检测重复值并删除

```
df[df.duplicated()]
```

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
15	11	Metapod	Bug	NaN	205	50	20	55	25	25	30	1	FALSE
23	17	Pidgeotto	Normal	Flying	349	63	60	55	50	50	71	1	FALSE
185	168	Ariados	Bug	Poison	390	70	90	70	60	60	40	2	FALSE
186	168	Ariados	Bug	Poison	390	70	90	70	60	60	40	2	FALSE
187	168	Ariados	Bug	Poison	390	70	90	70	60	60	40	2	FALSE

```
df = df.drop_duplicates()
df
```

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
0	1	Bulbasaur	Grass	Poison	318	45	49	49	65	65	45	1	FALSE
1	2	Ivysaur	Grass	Poison	405	60	62	63	80	80	60	1	FALSE
2	3	Venusaur	Grass	Poison	525	80	82	83	100	100	80	1	FALSE
3	3	VenusaurMega Venusaur	Grass	Poison	625	80	100	123	122	120	80	1	FALSE
4	4	Charmander	Fire	NaN	309	39	52	43	60	50	65	1	FALSE
...	...	...	...	...	...	...	...	...	...	...	...	...	...
801	719	Diancie	Rock	Fairy	600	50	100	150	100	150	50	6	TRUE
802	719	DiancieMega Diancie	Rock	Fairy	700	50	160	110	160	110	110	6	TRUE
803	720	HoopaHoopa Confined	Psychic	Ghost	600	80	110	60	150	130	70	6	TRUE
804	720	HoopaHoopa Unbound	Psychic	Dark	680	80	160	60	170	130	80	6	TRUE
805	721	Volcanion	Fire	Water	600	80	110	120	130	90	70	6	TRUE

797 rows × 13 columns

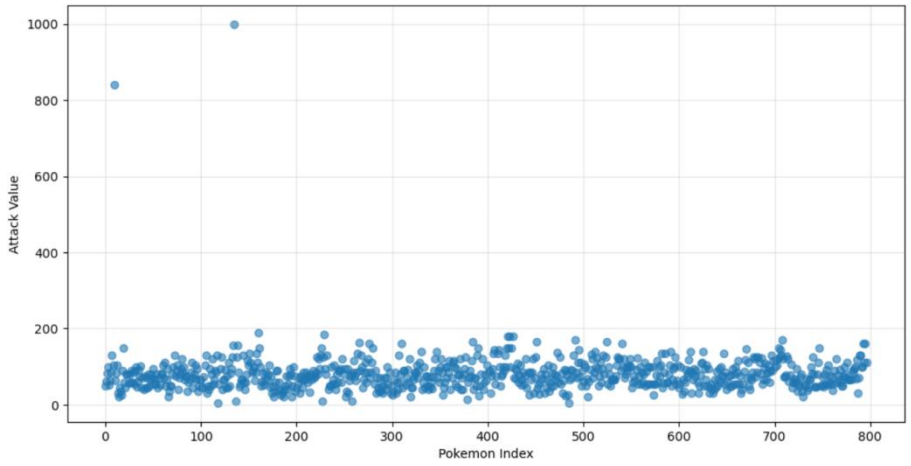
④Attack 属性存在过高的异常值

参考实验指导书绘制了一份散点图

```
df['Attack'] = pd.to_numeric(df.iloc[:, 6], errors='coerce')

x = np.arange(df.shape[0])
y = df['Attack']

plt.figure(figsize=(12, 6))
plt.scatter(x, y, alpha=0.6)
plt.xlabel("Pokemon Index")
plt.ylabel("Attack Value")
plt.grid(alpha=0.3)
plt.show()
```



发现存在异常值，采用 IQR 计算定位异常值并删除

```
Q1 = df['Attack'].quantile(0.25)
Q3 = df['Attack'].quantile(0.75)
IQR = Q3 - Q1

upper_threshold = Q3 + 1.5 * IQR
outliers = df[df['Attack'] > upper_threshold]

outliers
```

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
9	7	Squirtle	Water	NaN	314	44	840.0	65	50	64	43	1	FALSE
140	128	Tauros	Normal	NaN	490	75	1000.0	95	40	70	110	1	FALSE
165	150	MewtwoMega Mewtwo X	Psychic	Fighting	780	106	190.0	100	154	100	130	1	TRUE
237	214	HeracrossMega Heracross	Bug	Fighting	600	80	185.0	115	40	105	75	2	FALSE
430	383	GroudonPrimal Groudon	Ground	Fire	770	100	180.0	160	150	90	90	3	TRUE
432	384	RayquazaMega Rayquaza	Dragon	Flying	780	105	180.0	100	180	100	115	3	TRUE
435	386	DeoxysAttack Forme	Psychic	NaN	600	50	180.0	20	180	20	150	3	TRUE
500	445	GarchompMega Garchomp	Dragon	Ground	700	108	170.0	115	120	95	92	4	FALSE
717	646	KyuremBlack Kyurem	Dragon	Ice	700	125	170.0	100	120	90	95	5	TRUE

```
df = df[~df['Attack'].isin(outliers['Attack'])]
df
```

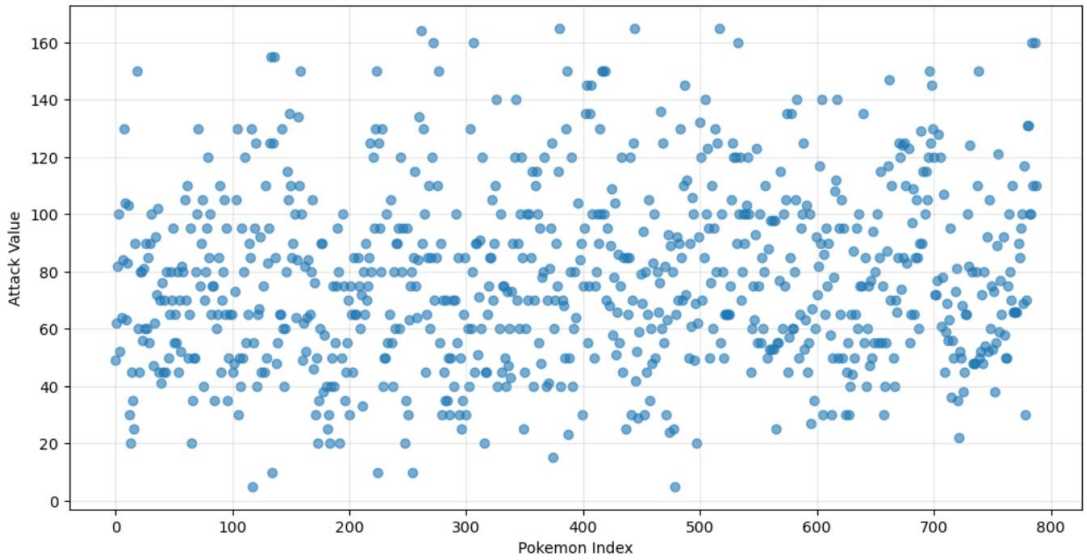
	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
0	1	Bulbasaur	Grass	Poison	318	45	49.0	49	65	65	45	1	FALSE
1	2	Ivysaur	Grass	Poison	405	60	62.0	63	80	80	60	1	FALSE
2	3	Venusaur	Grass	Poison	525	80	82.0	83	100	100	80	1	FALSE
3	3	VenusaurMega Venusaur	Grass	Poison	625	80	100.0	123	122	120	80	1	FALSE
4	4	Charmander	Fire	NaN	309	39	52.0	43	60	50	65	1	FALSE
...	...	...	...	...	...	...	...	...	...	...	...	...	...
801	719	Diancie	Rock	Fairy	600	50	100.0	150	100	150	50	6	TRUE
802	719	DiancieMega Diancie	Rock	Fairy	700	50	160.0	110	160	110	110	6	TRUE
803	720	HoopaHoopa Confined	Psychic	Ghost	600	80	110.0	60	150	130	70	6	TRUE
804	720	HoopaHoopa Unbound	Psychic	Dark	680	80	160.0	60	170	130	80	6	TRUE
805	721	Volcanion	Fire	Water	600	80	110.0	120	130	90	70	6	TRUE

788 rows × 13 columns

删除后的散点图如下所示

```
x = np.arange(df.shape[0])
y = df['Attack']

plt.figure(figsize=(12, 6))
plt.scatter(x, y, alpha=0.6)  # alpha=0.6 让点更清晰（避免重叠）
plt.xlabel("Pokemon Index")
plt.ylabel("Attack Value")
plt.grid(alpha=0.3)  # 添加网格线，便于观察
plt.show()
```



⑤有两条数据的 Generation 与 Legendary 属性被置换

首先检测 Generation 与 Legendary 中的特殊数据并查询数据类型

```
#查看两列的数据
print(df['Generation'].unique())
print(df['Legendary'].unique())
```

```
['1' 'FALSE' '2' '3' nan '4' '5' '6' 'undefined']
['FALSE' '1' '0' 'Poison' 'Ground' 'TRUE' nan]
```

```
#查询数据类型
df.dtypes
```

```
#               object
Name            object
Type 1          object
Type 2          object
Total           object
HP              object
Attack         float64
Defense         object
Sp. Atk         object
Sp. Def         object
Speed           object
Generation      object
Legendary       object
dtype: object
```

查看包含对应内容的行，发现 Legendary 中除属性置换外，还含有其他异常值

```
#查看包含目标内容的行
target_contents = ['FALSE','undefined']
df[df['Generation'].isin(target_contents)]
```

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
11	9	Blastoise	Water	NaN	530	79	83.0	100	85	105	78	FALSE	1
32	25	Pikachu	Electric	NaN	320	35	55.0	40	50	50	90	FALSE	0
771	695	Heliolisk	Electric	Normal	481	62	55.0	52	109	94	109	undefined	FALSE

```
#交换11、32行对应列内容
temp_generation_11 = df.loc[11, 'Generation']
temp_generation_32 = df.loc[32, 'Generation']

df.loc[11, 'Generation'] = df.loc[11, 'Legendary']
df.loc[32, 'Generation'] = df.loc[32, 'Legendary']

df.loc[11, 'Legendary'] = temp_generation_11
df.loc[32, 'Legendary'] = temp_generation_32

df.loc[11:11]
```

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
11	9	Blastoise	Water	NaN	530	79	83.0	100	85	105	78	1	FALSE

```
df.loc[32:32]
```

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
32	25	Pikachu	Electric	NaN	320	35	55.0	40	50	50	90	0	FALSE

上述将对应值置换过来后，将异常值一并删除

```
# 使用布尔索引删除指定的行
rows_to_delete = [45, 78, 115, 130,771]
df = df[~df.index.isin(rows_to_delete)]

print(df.loc[45:45])
print(df.loc[78:78])
print(df.loc[115:115])
print(df.loc[130:130])
print(df.loc[771:771])
```

```
Empty DataFrame
Columns: [#, Name, Type 1, Type 2, Total, HP, Attack, Defense, Sp. Atk, Sp. Def, Speed, Generation, Legendary]
Index: []
Empty DataFrame
Columns: [#, Name, Type 1, Type 2, Total, HP, Attack, Defense, Sp. Atk, Sp. Def, Speed, Generation, Legendary]
Index: []
Empty DataFrame
Columns: [#, Name, Type 1, Type 2, Total, HP, Attack, Defense, Sp. Atk, Sp. Def, Speed, Generation, Legendary]
Index: []
Empty DataFrame
Columns: [#, Name, Type 1, Type 2, Total, HP, Attack, Defense, Sp. Atk, Sp. Def, Speed, Generation, Legendary]
Index: []
Empty DataFrame
Columns: [#, Name, Type 1, Type 2, Total, HP, Attack, Defense, Sp. Atk, Sp. Def, Speed, Generation, Legendary]
Index: []
```

```
df
```

	#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
0	1	Bulbasaur	Grass	Poison	318	45	49.0	49	65	65	45	1	FALSE
1	2	Ivysaur	Grass	Poison	405	60	62.0	63	80	80	60	1	FALSE
2	3	Venusaur	Grass	Poison	525	80	82.0	83	100	100	80	1	FALSE
3	3	VenusaurMega Venusaur	Grass	Poison	625	80	100.0	123	122	120	80	1	FALSE
4	4	Charmander	Fire	NaN	309	39	52.0	43	60	50	65	1	FALSE
...	...	...	...	...	...	...	...	...	...	...	...	...	...
801	719	Diancie	Rock	Fairy	600	50	100.0	150	100	150	50	6	TRUE
802	719	DiancieMega Diancie	Rock	Fairy	700	50	160.0	110	160	110	110	6	TRUE
803	720	HoopaHoopa Confined	Psychic	Ghost	600	80	110.0	60	150	130	70	6	TRUE
804	720	HoopaHoopa Unbound	Psychic	Dark	680	80	160.0	60	170	130	80	6	TRUE
805	721	Volcanion	Fire	Water	600	80	110.0	120	130	90	70	6	TRUE

783 rows × 13 columns

2.5 心得与体会

通过本次数据质量实验，我明确了数据预处理作为保障分析结果可靠性的关键，实践了数据清洗核心流程。实验中结合初步观察与数据可视化来系统性地发现并定位无效数据、异常值和重复记录、字段错位问题。通过实验，加深了我对数据预处理基础保障作用的理解，掌握了一套行之有效的数据清洗流程与方法论，为后续分析奠定基础