山东大学计算机科学与技术学院

大数据分析与实践课程实验报告

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实验题目：实验 2		
实验学时：	实验日期：	

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。

实验过程：

1. 删除末尾 4 行无意义数据：

```
import pandas as pd
from pandas import DataFrame
import numpy as np
import matplotlib.pyplot as plt
data=pd.read_csv('Pokemon.csv', encoding='MacRoman')
data
```

	#	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
...	...	...	...	...	...	...	...	...	...	...	...	...	...
805	721	Volcanion	Fire	Water	600	80	110	120	130	90	70	6	TRUE
806	undefined	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	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

```
# 删除末尾 4 行（无意义）
data = data.iloc[:-4].copy()


data
```

2. 查看是否有重复数据

```
# 重复数据
duplicates = data[data.duplicated()]
duplicates
```

	#	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

对重复数据进行删除

```
#删除重复数据
data = data.drop_duplicates()
data
```

	#	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

801 rows × 13 columns

3. 查看缺失值

```
print(data.isnull().sum())
```
✓ 0.0s

```
#               1
Name            1
Type 1          2
Type 2        383
Total           1
HP              2
Attack          1
Defense         1
Sp. Atk         1
Sp. Def         1
Speed           1
Generation      1
Legendary       3
dtype: int64
```

可以看出来 Type 2 列存在大量缺失值，这可能是因为宝可梦不存在第二属性，事实上这是合理的，所以不能将 383 行全部删除，可以将缺失值填补为 None，再删除其他存在缺失值的行。

```
data.loc["Type 2"] = data["Type 2"].fillna("None")
data = data.dropna(how="any")
data.reset_index(drop=True, inplace=True)
data
```

	#	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	None	309	39	52	43	60	50	65	1	FALSE
...	...	...	...	...	...	...	...	...	...	...	...	...	...
792	719	Diancie	Rock	Fairy	600	50	100	150	100	150	50	6	TRUE
793	719	DiancieMega Diancie	Rock	Fairy	700	50	160	110	160	110	110	6	TRUE
794	720	HoopaHoopa Confined	Psychic	Ghost	600	80	110	60	150	130	70	6	TRUE
795	720	HoopaHoopa Unbound	Psychic	Dark	680	80	160	60	170	130	80	6	TRUE
796	721	Volcanion	Fire	Water	600	80	110	120	130	90	70	6	TRUE

797 rows × 13 columns

4.将本应是数值字段的列转化为数值字段

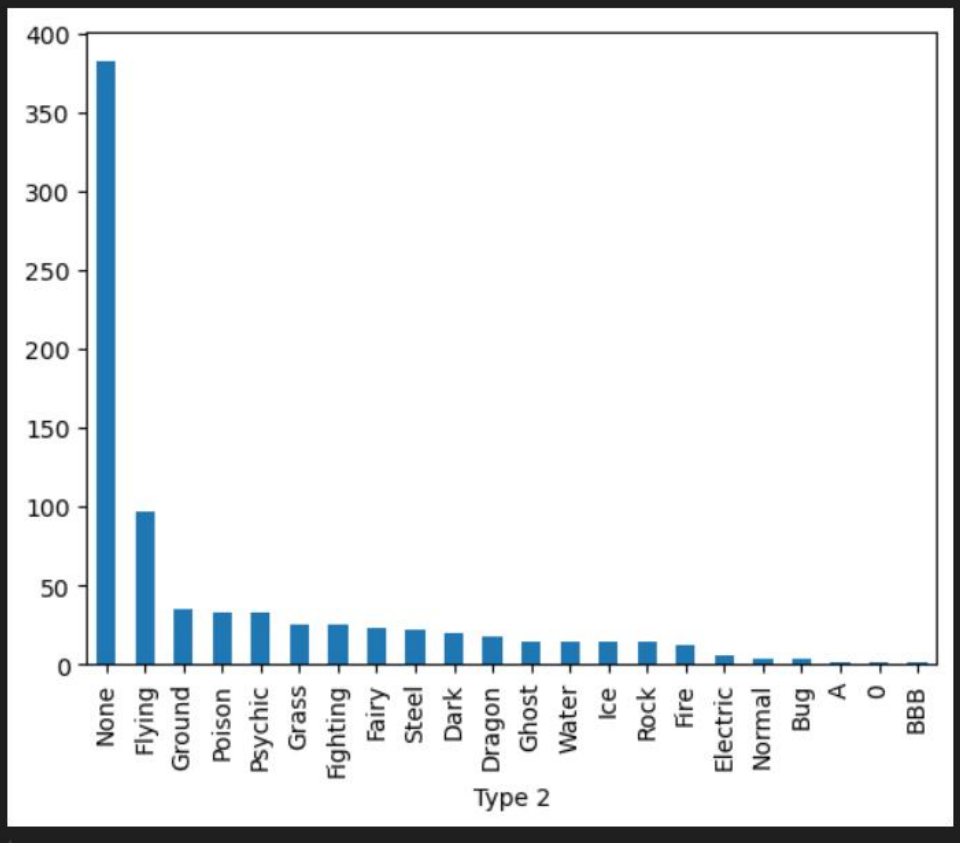
```
# 定义需要转换的字段
numeric_cols = ["Total", "HP", "Attack", "Defense", "Sp. Atk", "Sp. Def", "Speed", "Generation"]

# 清理字段中的非数值内容（根据检测结果调整）
for col in numeric_cols:
    if data[col].dtype == "object":
        # 去除特殊符号（如+、?、,）
        data[col] = data[col].str.replace(r"[^\d.]", "", regex=True)
        # 将空字符串或无法清理的值转换为 NaN
        data[col] = data[col].replace("", pd.NA)

for col in numeric_cols:
    # errors="coerce"：无法转换的值设为 NaN
    data[col] = pd.to_numeric(data[col], errors="coerce")
    # 若字段应为整数（无小数），转换为 int64（先填充缺失值，否则无法转为 int）
    data[col] = data[col].fillna(data[col].mean()).astype(int)  # 用均值填充缺失值
```

5.查看异常值

```python
# 统计 "Type 2" 列的频率分布
data["Type 2"].value_counts().plot(kind='bar')
```

✓ 0.5s

```
<Axes: xlabel='Type 2'>
```

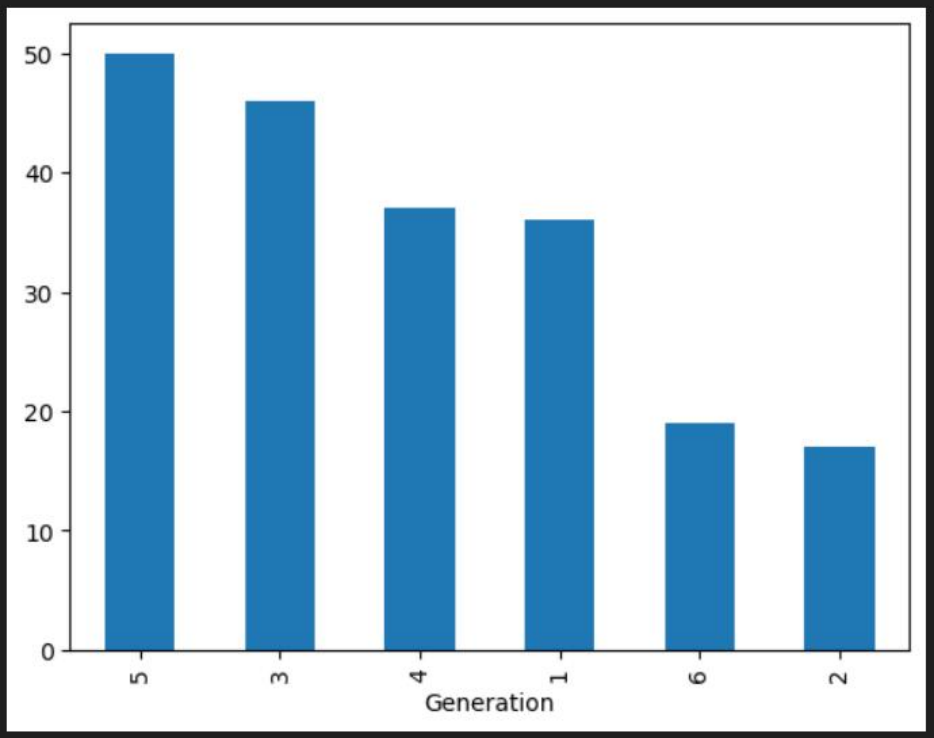



```python
# 去除 "Type 2" 列中值为 "A"、"BBB" 和 "0" 的行
data = data[~data["Type 2"].isin(["A", "BBB", "0"])]
```

```
data["Generation"].value_counts().plot(kind='bar')
```

[93] ✓ 0.3s

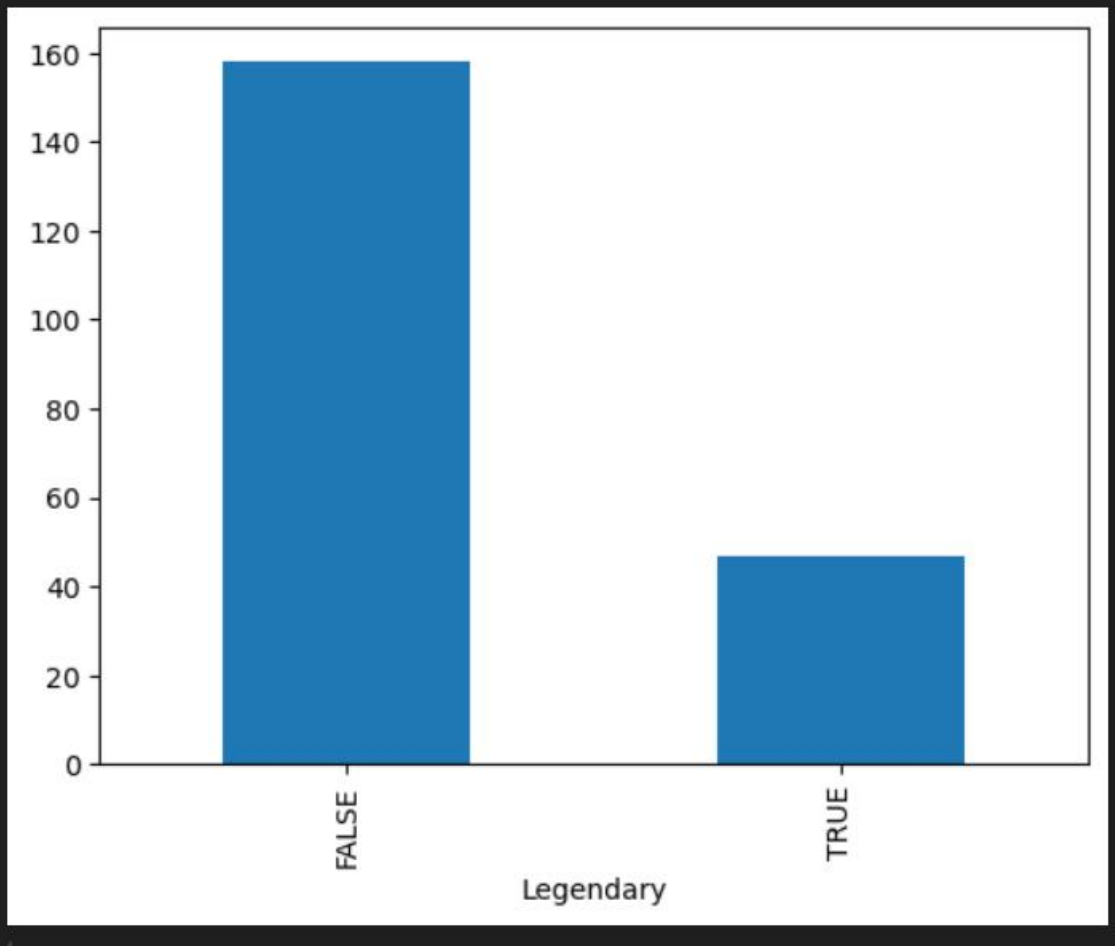
```
<Axes: xlabel='Generation'>
```



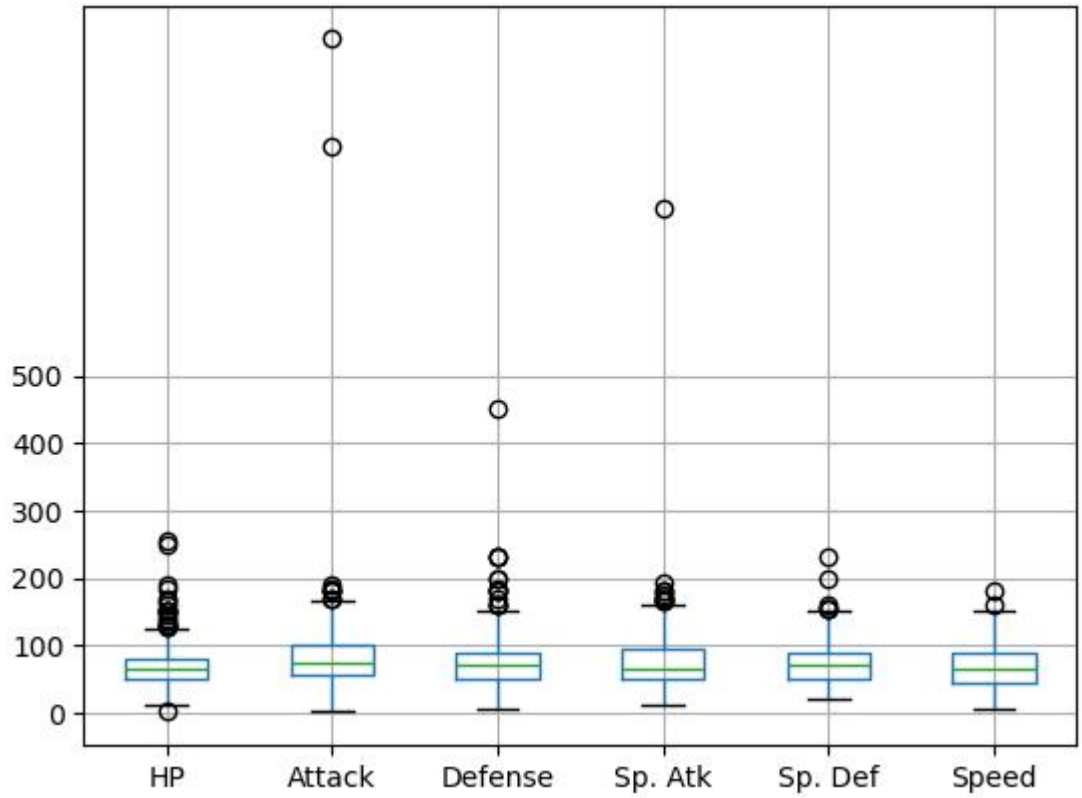
```
data["Legendary"].value_counts().plot(kind='bar')
```

✓ 0.2s

```
<Axes: xlabel='Legendary'>
```




```
#查看数值是否有异常值
data.boxplot(column=["HP","Attack", "Defense", "Sp. Atk", "Sp. Def", "Speed"])
plt.yticks([0,100,200,300,400,500])
```




```
#去除异常值
data = data[(data["Attack"] <= 400) & (data["Attack"] >= 100) & (data["Defense"] <= 400) & (data["Sp. Atk"] <= 400)]
```

6.数据一致性校验

```
    # 计算各单项能力值之和
    data["Calculated_Total"] = data["HP"] + data["Attack"] + data["Defense"] + data["Sp. Atk"] + data["Sp. Def"] + data["Speed"]

    # 查看Total与Calculated_Total不一致的记录
    inconsistent_rows = data[~data["Total"].round(0).eq(data["Calculated_Total"].round(0))]

    if len(inconsistent_rows) > 0:
        print("\n不一致记录示例：")
        print(inconsistent_rows[["Name", "Total", "Calculated_Total", "HP", "Attack", "Defense", "Sp. Atk", "Sp. Def", "Speed"]])

    # 用计算出的总能力值修正Total字段，确保数据一致性
    data.loc[:, "Total"] = data["Calculated_Total"]

    # 删除临时计算字段
    data.drop("Calculated_Total", axis=1, inplace=True)

    print("\n数据一致性校验与修正完成，Total字段已与各单项能力值之和保持一致。")
✓ 0.0s

不一致记录示例：
                    Name  Total  Calculated_Total   HP  Attack  Defense  \
784  GourgeistSuper Size    494               594  185     100      122
786              Avalugg    714               514   95     117      184

     Sp. Atk  Sp. Def  Speed
784       58       75     54
786       44       46     28

数据一致性校验与修正完成，Total字段已与各单项能力值之和保持一致。
```

7.清洗完毕，保存结果

```
#保存处理好的数据
data.to_csv('Pokemon_cleaned.csv', index=False)
```