PS2.ipynb | Untitled1.ipynb | Baoan_Weather_1998_2022.c

Code | Python 3 (ipykernel)

•[8]:
```
import pandas as pd
# import numpy
import numpy as np
# import matplotlib
from matplotlib import pyplot as plt
# make plots appear and be stored within the notebook
%matplotlib inline
```

•[18]:
```
# 1. Significant earthquakes since 2150 B.C.
# Read the file (e.g., earthquakes-2022-10-18_09-17-48_+0800.tsv) as an object and name it Sig_Eqs.
Sig_Eqs=pd.read_csv('D:\ese5023\earthquakes-2022-11-01_13-50-12_+0800.tsv',header=0, delimiter="\t")
Sig_Eqs
```

[18]:

Mo	Dy	Hr	Mn	Sec	Tsu	Vol	Country	...	Total Missing	Total Missing Description	Total Injuries	Total Injuries Description	Total Damage ($Mil)	Total Damage Description	Total Houses Destroyed	Total Houses Destroyed Description	Da
NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
NaN	NaN	NaN	NaN	0.0	NaN	NaN	JORDAN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
NaN	NaN	NaN	NaN	NaN	1.0	NaN	SYRIA	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
NaN	NaN	NaN	NaN	NaN	NaN	NaN	TURKMENISTAN	...	NaN	NaN	NaN	NaN	NaN	1.0	NaN	1.0	
NaN	NaN	NaN	NaN	NaN	3.0	1351.0	GREECE	...	NaN	NaN	NaN	NaN	NaN	3.0	NaN	NaN	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9.0	22.0	6.0	16.0	9.0	5861.0	NaN	MEXICO	...	NaN	NaN	3.0	1.0	NaN	2.0	NaN	NaN	
9.0	30.0	19.0	28.0	40.0	NaN	NaN	INDONESIA	...	NaN	NaN	NaN	1.0	NaN	2.0	NaN	NaN	
10.0	5.0	0.0	21.0	29.0	NaN	NaN	IRAN	...	NaN	NaN	1127.0	4.0	NaN	3.0	NaN	2.0	
10.0	5.0	8.0	26.0	21.0	NaN	NaN	PERU	...	NaN	NaN	2.0	1.0	NaN	NaN	NaN	NaN	
10.0	25.0	14.0	59.0	3.0	NaN	NaN	PHILIPPINES	...	NaN	NaN	84.0	2.0	1.4	2.0	14.0	1.0	

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Code | Python 3 (ipykernel)

•[24]:
```
# 1.1 [5 points] Compute the total number of deaths caused by earthquakes since 2150 B.C.in each country,
# and then print the top 20 countries along with the total number of deaths.
Sig_Eqs['Deaths'].sum()
```

[24]:
```
7849109.0
```

[25]:
```
Sig_Eqs.groupby(['Country'])['Deaths'].sum().head(20)
```

[25]:
```
Country
AFGHANISTAN             14254.0
ALBANIA                  3132.0
ALGERIA                 39339.0
ANTARCTICA                  0.0
ANTIGUA AND BARBUDA         0.0
ARGENTINA               22520.0
ARMENIA                191890.0
ATLANTIC OCEAN              0.0
AUSTRALIA                  12.0
AUSTRIA                  5040.0
AZERBAIJAN             317219.0
AZORES (PORTUGAL)        6354.0
BANGLADESH                336.0
BARBADOS                 3000.0
BELGIUM                     2.0
BERING SEA                  0.0
BHUTAN                     11.0
BOLIVIA                   111.0
BOSNIA-HERZEGOVINA         48.0
BRAZIL                      2.0
Name: Deaths, dtype: float64
```

[103]:
```
# 1.2 [10 points] Compute the total number of earthquakes with magnitude larger than 3.0 (use column Ms as the magnitude)
# worldwide each year,and then plot the time series. Do you observe any trend? Explain why or why not?
# Sig_Eqs['year0']=Sig_Eqs['Year'].astype(str)+'/'+Sig_Eqs['Month'].astype(str)+'/'+Sig_Eqs['Day'].astype(str)
                # +Sig_Eqs['Hour'].astype(str)+'/'+Sig_Eqs['Minute'].astype(str)+'/'+Sig_Eqs['Second'].astype(str)
# Sig_Eqs['Year0']=pd.to_datetime(Sig_Eqs['Year'])
# Sig_Eqs.set_index('Year0')
```

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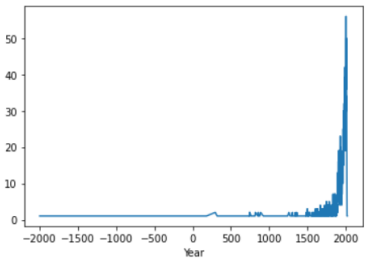
Code | Python 3 (ipykernel)

[103]:
```
Year
-2000.0     1.0
-479.0      1.0
-426.0      1.0
-400.0      1.0
-373.0      1.0
            ...
 2011.0    30.0
 2012.0    34.0
 2013.0    20.0
 2017.0     1.0
 2019.0     1.0
Name: one_earthquake, Length: 494, dtype: float64
```

[105]:
```
Sig_Eqs.where(Sig_Eqs['Ms']>3).groupby(['Year'])['one_earthquake'].sum().plot()
```

[105]:
```
<AxesSubplot:xlabel='Year'>
```



[110]:
```
# 1.3 [10 points] Write a function CountEq_LargestEq that returns
# (1) the total number of earthquakes since 2150 B.C.in a given country AND
# (2) date and location of the largest earthquake ever happened in this country. Apply CountEq_LargestEq to every country in the file,
# report your results in a descending order.

countryinput('请输入你的国家，')
```

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Code | Python 3 (ipykernel)

```
# (1) the total number of earthquakes since 2150 B.C.in a given country AND
# (2) date and location of the largest earthquake ever happened in this country. Apply CountEq_LargestEq to every country in the file,
# report your results in a descending order.

country=input('请输入你的国家，')
    list=Sig_Eqs.groupby(['Country'])['one_earthquake'].sum()
    list0=Sig_Eqs.groupby(['Country']).sort_values("MS", ascending=False),head(1)
    print(list[list.index['country']+[0,1]],list0[list0.index['country']+[0,1]])
```

```
  Input In [110]
    list=Sig_Eqs.groupby(['Country'])['one_earthquake'].sum()
    ^
IndentationError: unexpected indent
```

[114]:
```
list=Sig_Eqs.groupby(['Country'])['one_earthquake'].sum()
list
```

[114]:
```
Country
AFGHANISTAN                          62
ALBANIA                              56
ALGERIA                              57
ANTARCTICA                            5
ANTIGUA AND BARBUDA                   3
                                     ..
VENEZUELA                            66
VIETNAM                               5
WALLIS AND FUTUNA (FRENCH TERRITORY)  1
YEMEN                                10
ZAMBIA                                1
Name: one_earthquake, Length: 156, dtype: int64
```

[ ]:

[120]:
```
# 2. Air temperature in Shenzhen during the past 25 years
air_tem = pd.read_csv("Baoan_Weather_1998_2022.csv",usecols=['DATE','TMP'])
air_tem
```

[120]:

	DATE	TMP
0	1998-01-01T00:00:00	0186.1

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Code | Python 3 (ipykernel)

air_tem

[120]:

	DATE	TMP
0	1998-01-01T00:00:00	+0186,1
1	1998-01-01T01:00:00	+0220,1
2	1998-01-01T02:00:00	+0240,1
3	1998-01-01T03:00:00	+0221,1
4	1998-01-01T04:00:00	+0240,1
...	...	...
235669	2022-10-10T20:00:00	+0210,1
235670	2022-10-10T21:00:00	+0201,1
235671	2022-10-10T21:00:00	+0200,1
235672	2022-10-10T22:00:00	+0200,1
235673	2022-10-10T23:00:00	+0200,1

235674 rows × 2 columns

[131]:

```
# import pandas
import pandas as pd
# import numpy
import numpy as np
# import matplotlib
from matplotlib import pyplot as plt
# make plots appear and be stored within the notebook
%matplotlib inline
air_tem['mon']= pd.to_datetime(air_tem['DATE']).dt.month
air_tem['year']= pd.to_datetime(air_tem['DATE']).dt.year
air_tem
```

[131]:

	DATE	TMP	mon	year
0	1998-01-01T00:00:00	+0186,1	1	1998

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Code | Python 3 (ipykernel)

2	1998-01-01T02:00:00	+0240,1	1	1998
3	1998-01-01T03:00:00	+0221,1	1	1998
4	1998-01-01T04:00:00	+0240,1	1	1998
...	...	...	...	...
235669	2022-10-10T20:00:00	+0210,1	10	2022
235670	2022-10-10T21:00:00	+0201,1	10	2022
235671	2022-10-10T21:00:00	+0200,1	10	2022
235672	2022-10-10T22:00:00	+0200,1	10	2022
235673	2022-10-10T23:00:00	+0200,1	10	2022

235674 rows × 4 columns

[153]:

```
air_tem = air_tem.join(air_tem['TMP'].str.split(',',1, expand=True)).rename(columns={0:'tem_val',1:'CODE'})
air_tem
```

[153]:

	DATE	TMP	mon	year	temp value	CODE	tem_val	CODE	tem_val	CODE	tem_val	CODE	tem_val	CODE	tem_val	CODE	tem_val	CODE	ter
0	1998-01-01T00:00:00	+0186,1	1	1998	+0186	1	+0186	1	+0186	1	+0186	1	+0186	1	+0186	1	+0186	1	+
1	1998-01-01T01:00:00	+0220,1	1	1998	+0220	1	+0220	1	+0220	1	+0220	1	+0220	1	+0220	1	+0220	1	+
2	1998-01-01T02:00:00	+0240,1	1	1998	+0240	1	+0240	1	+0240	1	+0240	1	+0240	1	+0240	1	+0240	1	+
3	1998-01-01T03:00:00	+0221,1	1	1998	+0221	1	+0221	1	+0221	1	+0221	1	+0221	1	+0221	1	+0221	1	+
4	1998-01-01T04:00:00	+0240,1	1	1998	+0240	1	+0240	1	+0240	1	+0240	1	+0240	1	+0240	1	+0240	1	+
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
235669	2022-10-	+0210,1	10	2022	+0210	1	+0210	1	+0210	1	+0210	1	+0210	1	+0210	1	+0210	1	+

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Code | Python 3 (ipykernel)

```
[ ]: abnormal = air_tem.sort_values('CODE')['CODE'].loc[air_tem['CODE']!='1']
     abnormal.unique()
```

```
[ ]: air_tem.loc[air_tem['CODE']=='9']
     air_tem = air_tem.loc[air_tem['CODE']!='9']
     air_tem['TEMPERATURE'] = air_tem['tem_val'].map(int).apply(lambda x:x/10)
     air_tem['MONTHS'] = air_tem['year'].map(str) + '-' + air_tem['mon'].map(str)
     air_tem
```

```
[180]: # 3. Global collection of hurricanes
       df = pd.read_csv('ibtracs.ALL.list.v04r00.csv',
                        usecols=range(17),
                        skiprows=[1, 2],
                        parse_dates=['ISO_TIME'],
                        na_values=['NOT_NAMED', 'NAME'])
       df.head()
```

```
C:\Users\Administrator\AppData\Local\Temp\ipykernel_9600\2709306217.py:2: DtypeWarning: Columns (5) have mixed types. Specify dtype option on import or set low_memory=False.
  df = pd.read_csv('ibtracs.ALL.list.v04r00.csv',
```

[180]:

	SID	SEASON	NUMBER	BASIN	SUBBASIN	NAME	ISO_TIME	NATURE	LAT	LON	WMO_WIND	WMO_PRES	WMO_AGENCY	TRACK_TYI
0	1842298N11080	1842	1	NI	BB	NaN	1842-10-25 06:00:00	NR	10.8709	79.8265				ma
1	1842298N11080	1842	1	NI	BB	NaN	1842-10-25 09:00:00	NR	10.8431	79.3524				ma
2	1842298N11080	1842	1	NI	BB	NaN	1842-10-25 12:00:00	NR	10.8188	78.8772				ma
3	1842298N11080	1842	1	NI	BB	NaN	1842-10-25 15:00:00	NR	10.8000	78.4000				ma
							1842-10-							

ykernel) Idle — Mode: Edit — Ln 5, Col 8 — PS2.ipynb

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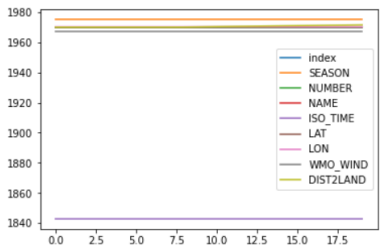
Code | Python 3 (ipykernel)

```
[187]: # 3.1
       df.groupby(['SID'])['WMO_WIND'].max().sort_values(ascending=0).head(10)
```

```
[187]: SID
       2015293N13266    185
       1980214N11330    165
       1997253N12255    160
       2005289N18282    160
       2019236N10314    160
       1988253N12306    160
       1935241N23291    160
       1998295N12284    155
       2017242N16333    155
       2009288N07267    155
       Name: WMO_WIND, dtype: int64
```

```
*[196]: # 3.2
        df.reset_index().head(20).plot()
```

```
[196]: <AxesSubplot:>
```




```
[200]: # 3.3
```

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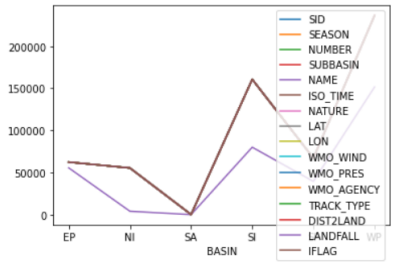
Code | Python 3 (ipykernel)

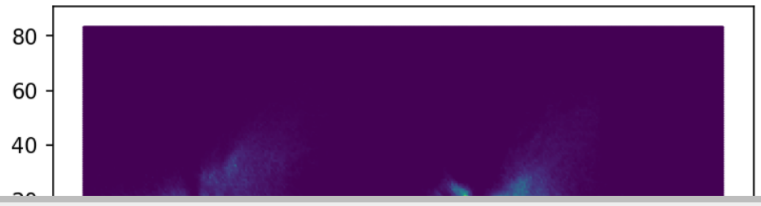
[200]:
```
# 3.3
df.groupby(['BASIN']).count().plot()
```

[200]:
```
<AxesSubplot:xlabel='BASIN'>
```



[205]:
```
# 3.4
fig, ax = plt.subplots(dpi=150)
ax.hexbin(df['LON'],df['LAT'],gridsize=300)
```

[205]:
```
<matplotlib.collections.PolyCollection at 0x1f11f82ea60>
```



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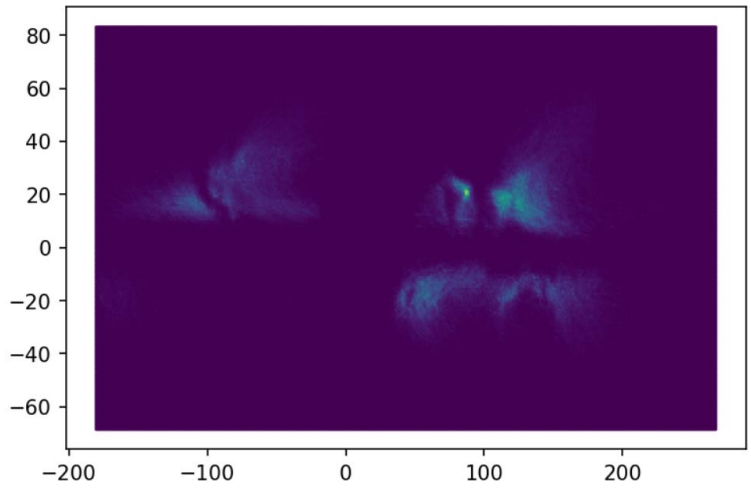
Code | Python 3 (ipykernel)

```
fig, ax = plt.subplots(dpi=150)
ax.hexbin(df['LON'],df['LAT'],gridsize=300)
```

[205]:
```
<matplotlib.collections.PolyCollection at 0x1f11f82ea60>
```



[209]:
```
# 3.5
tmk = df.loc[(df['NAME']=='MANGKHUT')&(df['SEASON']==2018)]
fig, ax = plt.subplots(dpi=150)
ax.scatter(tmk['LON'],tmk['LAT'],s = 1,c='1')
```

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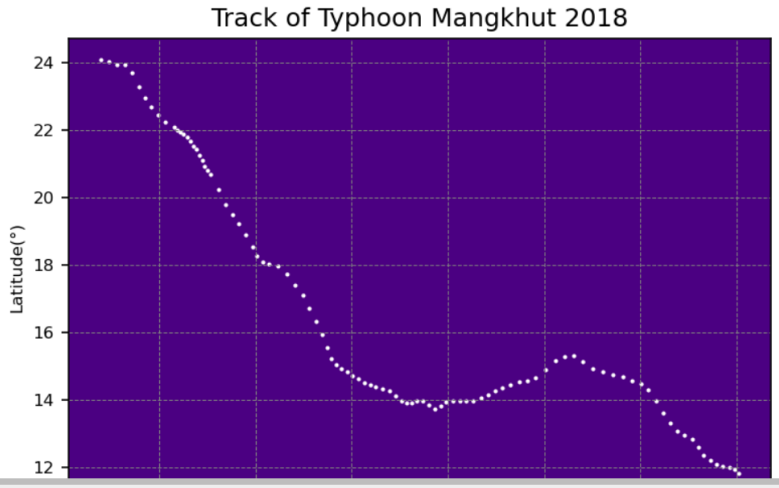
Code | Python 3 (ipykernel)

[209]:
```
# 3.5
tmk = df.loc[(df['NAME']=='MANGKHUT')&(df['SEASON']==2018)]
fig, ax = plt.subplots(dpi=150)
ax.scatter(tmk['LON'],tmk['LAT'],s = 1,c='1')
ax.set_xlabel('Longitude(°)',fontsize=8)
ax.set_ylabel('Latitude(°)',fontsize=8)
ax.set(title='Track of Typhoon Mangkhut 2018',
       facecolor='indigo')
ax.xaxis.set_tick_params(labelsize=8)
ax.yaxis.set_tick_params(labelsize=8)
ax.grid(color = 'grey', linestyle = 'dashed', linewidth=0.5)
```



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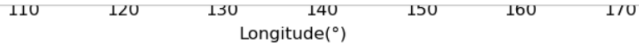
Code | Python 3 (ipykernel)



[210]:
```
# 3.6
df.loc[(df['SEASON']>1969)&((df['BASIN']=='WP')|(df['BASIN']=='EP'))].copy().head()
```

[210]:

	SID	SEASON	NUMBER	BASIN	SUBBASIN	NAME	ISO_TIME	NATURE	LAT	LON	WMO_WIND	WMO_PRES	WMO_AGENCY	TRA
350393	1970050N07151	1970	22	WP	MM	NANCY	1970-02-19 00:00:00	TS	7.00000	151.400	-999	1006	tokyo	
350394	1970050N07151	1970	22	WP	MM	NANCY	1970-02-19 03:00:00	TS	7.24752	151.205	-999			
350395	1970050N07151	1970	22	WP	MM	NANCY	1970-02-19 06:00:00	TS	7.50000	151.000	-999	1002	tokyo	
350396	1970050N07151	1970	22	WP	MM	NANCY	1970-02-19 09:00:00	TS	7.75747	150.772	-999			
350397	1970050N07151	1970	22	WP	MM	NANCY	1970-02-19 12:00:00	TS	8.00000	150.500	-999	998	tokyo	

[ ]:
```
# 3.7
df['DATE'] = ndf['ISO_TIME'].dt.date
df.head()
```