DATA WRANGLING AIR QUALITY DATASETS

WITH PYTHON
BY DR. ALVIN ANG

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I. AIR QUALITY DATASETS

https://www.alvinang.sg/s/Air-Quality-No-2.csv

https://www.alvinang.sg/s/Air-Quality-PM-25.csv

https://www.alvinang.sg/s/Data_Wrangling_Air_Quality_Datasets_with_Python_by_Dr_Alvin_Ang.ipynb

Screenshot for Air Quality No. 2 Long.csv:

	A	B	C	D	E	F	G
1	city	country	date.utc	location	parameter	value	unit
2	Paris	FR	2019-06-21 00:00:00+00:00	FR04014	no2	20	µg/m³
3	Paris	FR	2019-06-20 23:00:00+00:00	FR04014	no2	21.8	µg/m³
4	Paris	FR	2019-06-20 22:00:00+00:00	FR04014	no2	26.5	µg/m³
5	Paris	FR	2019-06-20 21:00:00+00:00	FR04014	no2	24.9	µg/m³
6	Paris	FR	2019-06-20 20:00:00+00:00	FR04014	no2	21.4	µg/m³
7	Paris	FR	2019-06-20 19:00:00+00:00	FR04014	no2	25.3	µg/m³
8	Paris	FR	2019-06-20 18:00:00+00:00	FR04014	no2	23.9	µg/m³
9	Paris	FR	2019-06-20 17:00:00+00:00	FR04014	no2	23.2	µg/m³
10	Paris	FR	2019-06-20 16:00:00+00:00	FR04014	no2	19	µg/m³
11	Paris	FR	2019-06-20 15:00:00+00:00	FR04014	no2	19.3	µg/m³

Screenshot for Air Quality pm25 long.csv

	A	B	C	D	E	F	G
1	city	country	date.utc	location	parameter	value	unit
2	Antwerpen	BE	2019-06-18 06:00:00+00:00	BETR801	pm25	18	µg/m³
3	Antwerpen	BE	2019-06-17 08:00:00+00:00	BETR801	pm25	6.5	µg/m³
4	Antwerpen	BE	2019-06-17 07:00:00+00:00	BETR801	pm25	18.5	µg/m³
5	Antwerpen	BE	2019-06-17 06:00:00+00:00	BETR801	pm25	16	µg/m³
6	Antwerpen	BE	2019-06-17 05:00:00+00:00	BETR801	pm25	7.5	µg/m³
7	Antwerpen	BE	2019-06-17 04:00:00+00:00	BETR801	pm25	7.5	µg/m³
8	Antwerpen	BE	2019-06-17 03:00:00+00:00	BETR801	pm25	7	µg/m³

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II. CONCATENATING THE TWO CSVS

A. IMPORTING AIR QUALITY DATASETS

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B. CONCATENATING AQ2 AND AQ25 TOGETHER

A2) Concatenating AQ2 and AQ25 Together

```
[4] #Slice out Date / Location / Parameter / Value

    AQ2 = AQ2[["date.utc", "location", "parameter", "value"]]
    AQ2.sample()
```

	date.utc	location	parameter	value
1179	2019-06-13 22:00:00+00:00	London Westminster	no2	15.0

```
#Slice out Date / Location / Parameter / Value

AQ25 = AQ25[["date.utc", "location", "parameter", "value"]]
AQ25.sample()
```

	date.utc	location	parameter	value
865	2019-05-17 15:00:00+00:00	London Westminster	pm25	10.0

```
[6] AQ = pd.concat([AQ25, AQ2], axis = 0)
```

```
AQ
```

	date.utc	location	parameter	value
0	2019-06-18 06:00:00+00:00	BETR801	pm25	18.0
1	2019-06-17 08:00:00+00:00	BETR801	pm25	6.5
2	2019-06-17 07:00:00+00:00	BETR801	pm25	18.5
3	2019-06-17 06:00:00+00:00	BETR801	pm25	16.0
4	2019-06-17 05:00:00+00:00	BETR801	pm25	7.5
...	...	...	...	...
2063	2019-05-07 06:00:00+00:00	London Westminster	no2	26.0
2064	2019-05-07 04:00:00+00:00	London Westminster	no2	16.0
2065	2019-05-07 03:00:00+00:00	London Westminster	no2	19.0
2066	2019-05-07 02:00:00+00:00	London Westminster	no2	19.0
2067	2019-05-07 01:00:00+00:00	London Westminster	no2	23.0

3178 rows × 4 columns

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C. LOOKING AT THE SHAPE OF THE CONCATTED TABLE

A3) Looking at the Shape of the Concatted Table

```
print("Shape of AQ2: ", AQ2.shape)
print("Shape of AQ25: ", AQ25.shape)
print("Shape of AQ: ", AQ.shape)

#2068 rows + 1110 rows = 3178 rows
#note: 4 columns stick to 4 columns even after concatenating

#in short, this means that Concatenating = Union both tables
#(top down) paste --> AQ25 paste on top of AQ2
```

```
Shape of AQ2:  (2068, 4)
Shape of AQ25:  (1110, 4)
Shape of AQ:  (3178, 4)
```


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III. INNER JOIN

A. MERGE BASED ON LOCATION

B. Inner Join

B1) Merge based on Location

```
[9] #AQ2 --> Air Quality No. 2.csv
    #AQ25 --> Air Quality PM 25.csv

    AQ_Merge_1 = pd.merge(AQ25, AQ2, on='location')
    AQ_Merge_1.head()
```

	date.utc_x	location	parameter_x	value_x	date.utc_y	parameter_y	value_y
0	2019-06-18 06:00:00+00:00	BETR801	pm25	18.0	2019-06-17 08:00:00+00:00	no2	41.0
1	2019-06-18 06:00:00+00:00	BETR801	pm25	18.0	2019-06-17 07:00:00+00:00	no2	45.0
2	2019-06-18 06:00:00+00:00	BETR801	pm25	18.0	2019-06-17 06:00:00+00:00	no2	43.5
3	2019-06-18 06:00:00+00:00	BETR801	pm25	18.0	2019-06-17 05:00:00+00:00	no2	42.5
4	2019-06-18 06:00:00+00:00	BETR801	pm25	18.0	2019-06-17 04:00:00+00:00	no2	39.5

B. MERGE BASED ON DATE

B2) Merge based on Date

```
[10] AQ_Merge_2 = pd.merge(AQ25, AQ2, on='date.utc')
     AQ_Merge_2.head()
```

	date.utc	location_x	parameter_x	value_x	location_y	parameter_y	value_y
0	2019-06-18 06:00:00+00:00	BETR801	pm25	18.0	FR04014	no2	51.4
1	2019-06-18 06:00:00+00:00	London Westminster	pm25	7.0	FR04014	no2	51.4
2	2019-06-17 08:00:00+00:00	BETR801	pm25	6.5	FR04014	no2	51.6
3	2019-06-17 08:00:00+00:00	BETR801	pm25	6.5	BETR801	no2	41.0
4	2019-06-17 08:00:00+00:00	BETR801	pm25	6.5	London Westminster	no2	13.0

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IV. DATE TIME FORMATTING

A. RENAMING THE COLUMN 'DATE.UTC' TO "DATE TIME"

C. Date-Time Formatting

C1) Renaming the Column 'Date.utc' to "DateTime"

```
import pandas as pd

AQ2 = pd.read_csv("https://www.alvinang.sg/s/Air-Quality-No-2.csv")
```

```
[13] AQ2 = AQ2.rename(columns = {"date.utc":"datetime"})
```

```
AQ2.head()
```

	city	country	datetime	location	parameter	value	unit
0	Paris	FR	2019-06-21 00:00:00+00:00	FR04014	no2	20.0	µg/m³
1	Paris	FR	2019-06-20 23:00:00+00:00	FR04014	no2	21.8	µg/m³
2	Paris	FR	2019-06-20 22:00:00+00:00	FR04014	no2	26.5	µg/m³
3	Paris	FR	2019-06-20 21:00:00+00:00	FR04014	no2	24.9	µg/m³
4	Paris	FR	2019-06-20 20:00:00+00:00	FR04014	no2	21.4	µg/m³

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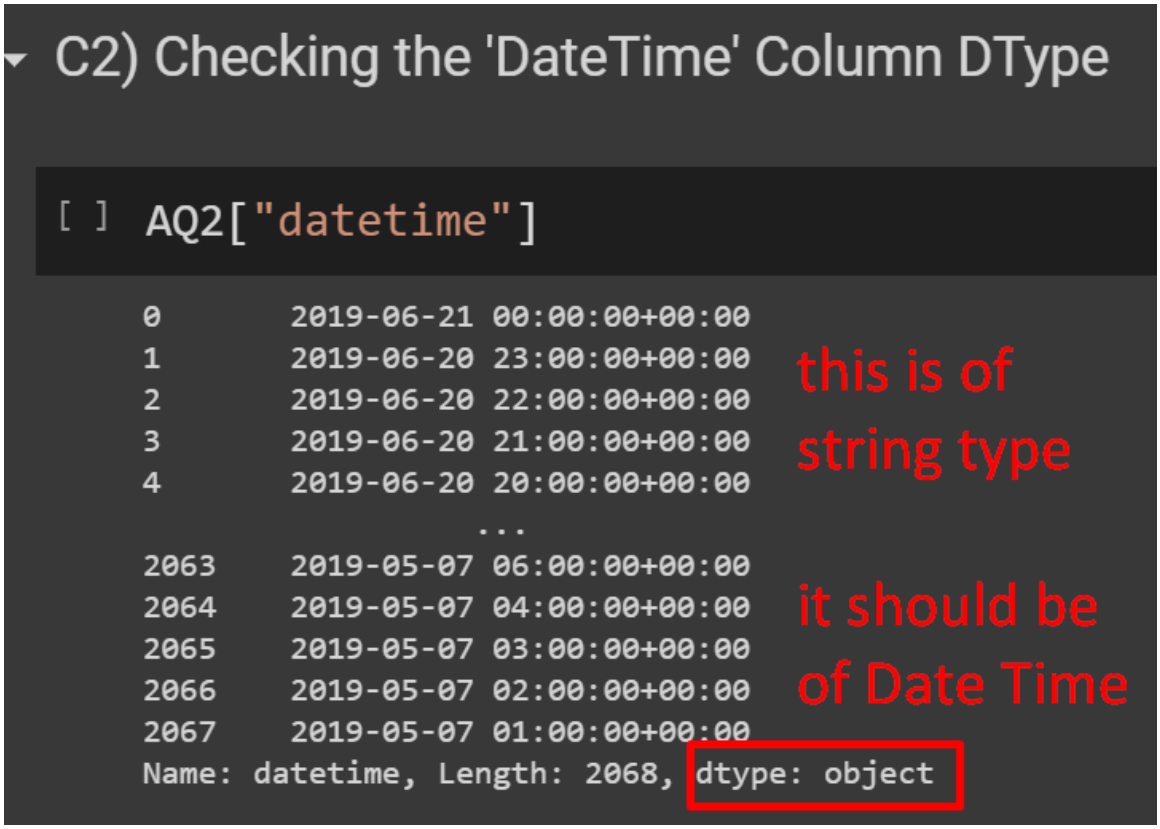
B. CHECKING THE 'DATETIME' COLUMN DTYPE



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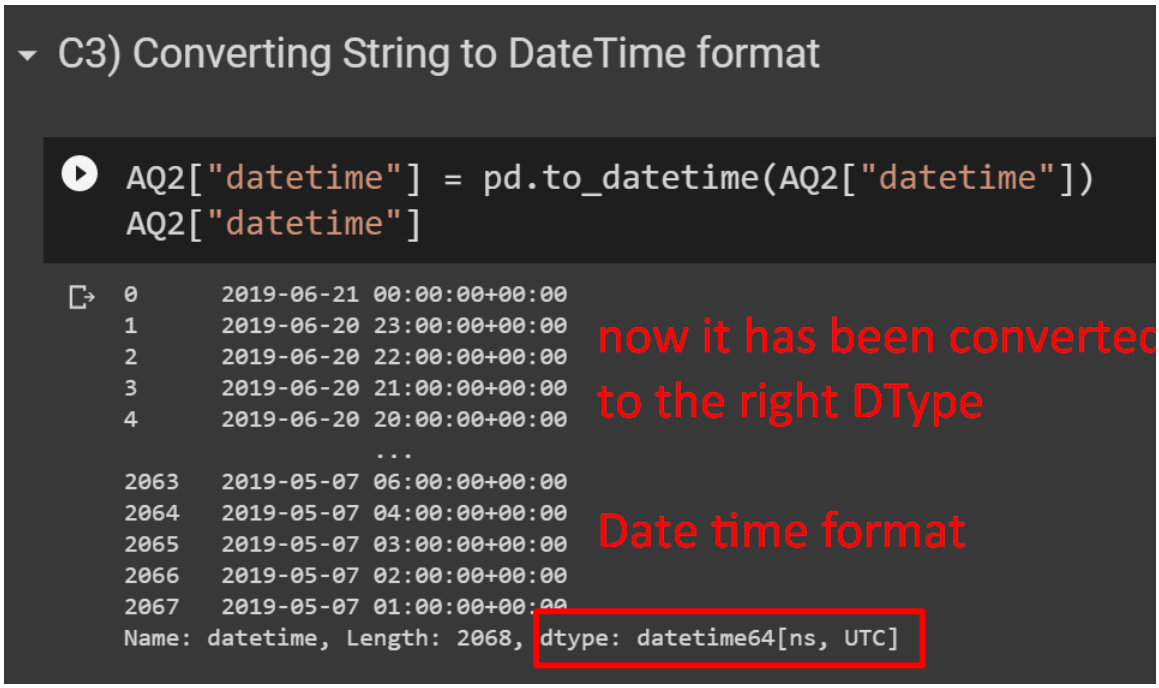
C. CONVERTING STRING TO DATE TIME FORMAT



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D. FINDING THE EARLIEST AND LATEST DATES

C4) Finding the Earliest and Latest Dates

```
AQ2["datetime"].min(),\
AQ2["datetime"].max()

#earliest date = 7/5/2019
#latest date = 21/6/2019
```

```
(Timestamp('2019-05-07 01:00:00+0000', tz='UTC'),
 Timestamp('2019-06-21 00:00:00+0000', tz='UTC'))
```


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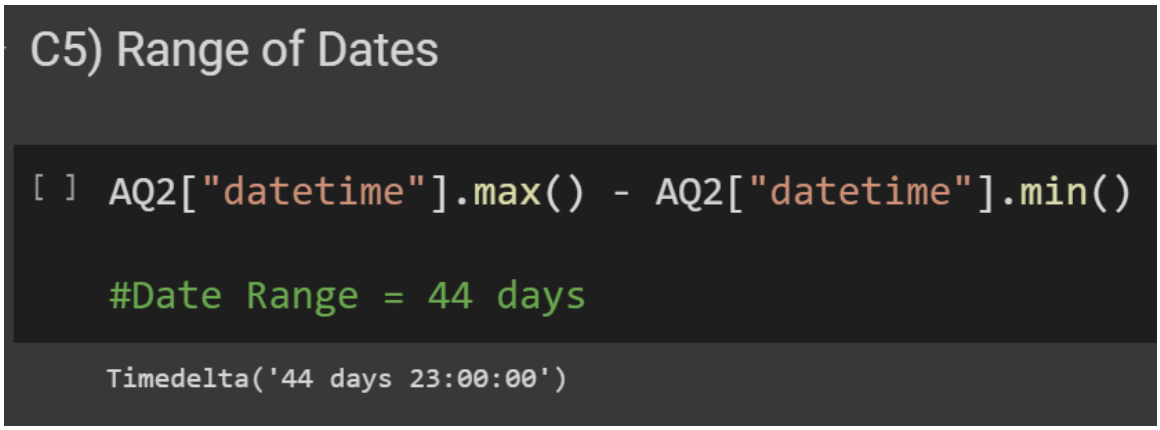
E. RANGE OF DATES



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F. CREATING A NEW COLUMN CALLED MONTH

C6) Creating a New Month Column

```
[ ] AQ2["month"] = AQ2["datetime"].dt.month
```

```
AQ2

#a new month column has been created!
```

new month column

	city	country	datetime	location	parameter	value	unit	month
0	Paris	FR	2019-06-21 00:00:00+00:00	FR04014	no2	20.0	µg/m³	6
1	Paris	FR	2019-06-20 23:00:00+00:00	FR04014	no2	21.8	µg/m³	6
2	Paris	FR	2019-06-20 22:00:00+00:00	FR04014	no2	26.5	µg/m³	6
3	Paris	FR	2019-06-20 21:00:00+00:00	FR04014	no2	24.9	µg/m³	6
4	Paris	FR	2019-06-20 20:00:00+00:00	FR04014	no2	21.4	µg/m³	6
...	...	...	...	...	...	...	...	...
2063	London	GB	2019-05-07 06:00:00+00:00	London Westminster	no2	26.0	µg/m³	5
2064	London	GB	2019-05-07 04:00:00+00:00	London Westminster	no2	16.0	µg/m³	5
2065	London	GB	2019-05-07 03:00:00+00:00	London Westminster	no2	19.0	µg/m³	5
2066	London	GB	2019-05-07 02:00:00+00:00	London Westminster	no2	19.0	µg/m³	5
2067	London	GB	2019-05-07 01:00:00+00:00	London Westminster	no2	23.0	µg/m³	5

2068 rows × 8 columns

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G. AVERAGE WEEKDAY AIR QUALITY (GROUPBY LOCATION)

C7) Average Weekday Air Quality (Groupby Location)

```
[ ] AQ2.groupby([AQ2["datetime"].dt.weekday, "location"])["value"].mean()
```

```
datetime  location
0         BETR801              27.875000
          FR04014              24.856250
          London Westminster   23.969697
1         BETR801              22.214286
          FR04014              30.999359
          London Westminster   24.885714
2         BETR801              21.125000
          FR04014              29.165753
          London Westminster   23.460432
3         BETR801              27.500000
          FR04014              28.600690
          London Westminster   24.780142
4         BETR801              28.400000
          FR04014              31.617986
          London Westminster   26.446809
5         BETR801              33.500000
          FR04014              25.266154
          London Westminster   24.977612
6         BETR801              21.896552
          FR04014              23.274306
          London Westminster   24.859155
Name: value, dtype: float64
```

THE END

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ABOUT DR. ALVIN ANG

Dr. Alvin Ang earned his Ph.D., Masters and Bachelor degrees from NTU, Singapore. He is a scientist, entrepreneur, as well as a personal/business advisor. More about him at www.AlvinAng.sg.

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