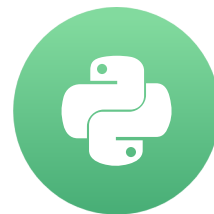


Using `merge_ordered()`

JOINING DATA WITH PANDAS



Aaren Stubberfield
Instructor

merge_ordered()

Left Table

A	B	C
A3	B3	C3
A2	B2	C2
A1	B1	C1



Right Table

C	D
C4	D4
C2	D2
C1	D1

=

Result Table

A	B	C	D
A1	B1	C1	D1
A2	B2	C2	D2
A3	B3	C3	
		C4	D4

Method comparison

`.merge()` method:

- Column(s) to join on
 - `on` , `left_on` , and `right_on`
- Type of join
 - `how` (*left, right, inner, outer*) `{{@}}`
 - **default** inner
- Overlapping column names
 - `suffixes`
- Calling the method
 - `df1.merge(df2)`

`merge_ordered()` method:

- Column(s) to join on
 - `on` , `left_on` , and `right_on`
- Type of join
 - `how` (*left, right, inner, outer*)
 - **default** outer
- Overlapping column names
 - `suffixes`
- Calling the function
 - `pd.merge_ordered(df1, df2)`

Financial dataset



¹ Photo by Markus Spiske on Unsplash

Stock data

Table Name: `apl`

	date	close
0	2007-02-01	12.087143
1	2007-03-01	13.272857
2	2007-04-01	14.257143
3	2007-05-01	17.312857
4	2007-06-01	17.434286

Table Name: `mcd`

	date	close
0	2007-01-01	44.349998
1	2007-02-01	43.689999
2	2007-03-01	45.049999
3	2007-04-01	48.279999
4	2007-05-01	50.549999

Merging stock data

```
import pandas as pd
pd.merge_ordered(app1, mcd, on='date', suffixes=('_aapl', '_mcd'))
```

	date	close_aapl	close_mcd
0	2007-01-01	NaN	44.349998
1	2007-02-01	12.087143	43.689999
2	2007-03-01	13.272857	45.049999
3	2007-04-01	14.257143	48.279999
4	2007-05-01	17.312857	50.549999
5	2007-06-01	17.434286	NaN

Forward fill

Before

A	B
A1	B1
A2	
A3	B3
A4	
A5	B5

After

A	B
A1	B1
A2	B1
A3	B3
A4	B3
A5	B5

Fills missing
with
previous
value



Forward fill example

```
pd.merge_ordered(app1, mcd, on='date',  
                 suffixes=('_aapl', '_mcd'),  
                 fill_method='ffill')
```

	date	close_aapl	close_mcd
0	2007-01-01	NaN	44.349998
1	2007-02-01	12.087143	43.689999
2	2007-03-01	13.272857	45.049999
3	2007-04-01	14.257143	48.279999
4	2007-05-01	17.312857	50.549999
5	2007-06-01	17.434286	50.549999

```
pd.merge_ordered(app1, mcd, on='date',  
                 suffixes=('_aapl', '_mcd'))
```

	date	close_AAPL	close_mcd
0	2007-01-01	NaN	44.349998
1	2007-02-01	12.087143	43.689999
2	2007-03-01	13.272857	45.049999
3	2007-04-01	14.257143	48.279999
4	2007-05-01	17.312857	50.549999
5	2007-06-01	17.434286	NaN

When to use `merge_ordered()`?

- Ordered data / time series
- Filling in missing values

Let's practice!

JOINING DATA WITH PANDAS

Using merge_asof()

JOINING DATA WITH PANDAS



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Using merge_asof()

Left Table			Right Table			Result Table		
B	C		C	D	=	B	C	D
B2	1	↔	1	D1	=	B2	1	D1
B3	5		2	D2		B3	5	D3
B4	10		3	D3		B4	10	D7
			6	D6				
			7	D7				

- Similar to a `merge_ordered()` left-join
 - Similar features as `merge_ordered()`
- Match on the nearest key column and not exact matches.
 - Merged "on" columns must be sorted.

Using merge_asof()

Left Table		Right Table		Result Table			
B	C	C	D	=	B	C	D
B2	1	1	D1	=	B2	1	D1
B3	5	2	D2		B3	5	D3
B4	10	3	D3		B4	10	D7
		6	D6				
		7	D7				

- Similar to a `merge_ordered()` left-join
 - Similar features as `merge_ordered()`
- Match on the nearest key column and not exact matches.
 - Merged "on" columns must be sorted.

Datasets

Table Name: visa

	date_time	close
0	2017-11-17 16:00:00	110.32
1	2017-11-17 17:00:00	110.24
2	2017-11-17 18:00:00	110.065
3	2017-11-17 19:00:00	110.04
4	2017-11-17 20:00:00	110.0
5	2017-11-17 21:00:00	109.9966
6	2017-11-17 22:00:00	109.82

Table Name: ibm

	date_time	close
0	2017-11-17 15:35:12	149.3
1	2017-11-17 15:40:34	149.13
2	2017-11-17 15:45:50	148.98
3	2017-11-17 15:50:20	148.99
4	2017-11-17 15:55:10	149.11
5	2017-11-17 16:00:03	149.25
6	2017-11-17 16:05:06	149.5175
7	2017-11-17 16:10:12	149.57
8	2017-11-17 16:15:30	149.59
9	2017-11-17 16:20:32	149.82
10	2017-11-17 16:25:47	149.96

merge_asof() example

```
pd.merge_asof(visa, ibm, on='date_time',  
              suffixes=('_visa', '_ibm'))
```

	date_time	close_visa	close_ibm
0	2017-11-17 16:00:00	110.32	149.11
1	2017-11-17 17:00:00	110.24	149.83
2	2017-11-17 18:00:00	110.065	149.59
3	2017-11-17 19:00:00	110.04	149.505
4	2017-11-17 20:00:00	110.0	149.42
5	2017-11-17 21:00:00	109.9966	149.26
6	2017-11-17 22:00:00	109.82	148.97

Table Name: `ibm`

	date_time	close
0	2017-11-17 15:35:12	149.3
1	2017-11-17 15:40:34	149.13
2	2017-11-17 15:45:50	148.98
3	2017-11-17 15:50:20	148.99
4	2017-11-17 15:55:10	149.11
5	2017-11-17 16:00:03	149.25
6	2017-11-17 16:05:06	149.5175
7	2017-11-17 16:10:12	149.57
8	2017-11-17 16:15:30	149.59
9	2017-11-17 16:20:32	149.82
10	2017-11-17 16:25:47	149.96

merge_asof() example with direction

```
pd.merge_asof(visa, ibm, on=['date_time'],
               suffixes=('_visa', '_ibm'),
               direction='forward')
```

Table Name: `ibm`

	date_time	close_visa	close_ibm
0	2017-11-17 16:00:00	110.32	149.25
1	2017-11-17 17:00:00	110.24	149.6184
2	2017-11-17 18:00:00	110.065	149.59
3	2017-11-17 19:00:00	110.04	149.505
4	2017-11-17 20:00:00	110.0	149.42
5	2017-11-17 21:00:00	109.9966	149.26
6	2017-11-17 22:00:00	109.82	148.97

	date_time	close
0	2017-11-17 15:35:12	149.3
1	2017-11-17 15:40:34	149.13
2	2017-11-17 15:45:50	148.98
3	2017-11-17 15:50:20	148.99
4	2017-11-17 15:55:10	149.11
5	2017-11-17 16:00:03	149.25
6	2017-11-17 16:05:06	149.5175
7	2017-11-17 16:10:12	149.57
8	2017-11-17 16:15:30	149.59
9	2017-11-17 16:20:32	149.82
10	2017-11-17 16:25:47	149.96

When to use `merge_asof()`

- Data sampled from a process
- Developing a training set (no data leakage)

Let's practice!

JOINING DATA WITH PANDAS

Selecting data with `.query()`

JOINING DATA WITH PANDAS



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Instructor

The .query() method

```
.query( 'SOME SELECTION STATEMENT' )
```

- Accepts an input string
 - Input string used to determine what rows are returned
 - Input string similar to statement after **WHERE** clause in **SQL** statement
 - Prior knowledge of **SQL** is not necessary

Querying on a single condition

This table is `stocks`

	date	disney	nike
0	2019-07-01	143.009995	86.029999
1	2019-08-01	137.259995	84.5
2	2019-09-01	130.320007	93.919998
3	2019-10-01	129.919998	89.550003
4	2019-11-01	151.580002	93.489998
5	2019-12-01	144.630005	101.309998
6	2020-01-01	138.309998	96.300003
7	2020-02-01	117.650002	89.379997
8	2020-03-01	96.599998	82.739998
9	2020-04-01	99.580002	84.629997

```
stocks.query('nike >= 90')
```

	date	disney	nike
2	2019-09-01	130.320007	93.919998
4	2019-11-01	151.580002	93.489998
5	2019-12-01	144.630005	101.309998
6	2020-01-01	138.309998	96.300003

Querying on a multiple conditions, "and", "or"

This table is `stocks`

	date	disney	nike
0	2019-07-01	143.009995	86.029999
1	2019-08-01	137.259995	84.5
2	2019-09-01	130.320007	93.919998
3	2019-10-01	129.919998	89.550003
4	2019-11-01	151.580002	93.489998
5	2019-12-01	144.630005	101.309998
6	2020-01-01	138.309998	96.300003
7	2020-02-01	117.650002	89.379997
8	2020-03-01	96.599998	82.739998
9	2020-04-01	99.580002	84.629997

```
stocks.query('nike > 90 and disney < 140')
```

	date	disney	nike
2	2019-09-01	130.320007	93.919998
6	2020-01-01	138.309998	96.300003

```
stocks.query('nike > 96 or disney < 98')
```

	date	disney	nike
5	2019-12-01	144.630005	101.309998
6	2020-01-01	138.309998	96.300003
28	2020-03-01	96.599998	82.739998

Updated dataset

This table is `stocks_long`

	date	stock	close
0	2019-07-01	disney	143.009995
1	2019-08-01	disney	137.259995
2	2019-09-01	disney	130.320007
3	2019-10-01	disney	129.919998
4	2019-11-01	disney	151.580002
5	2019-07-01	nike	86.029999
6	2019-08-01	nike	84.5
7	2019-09-01	nike	93.919998
8	2019-10-01	nike	89.550003
9	2019-11-01	nike	93.489998

Using .query() to select text

```
stocks_long.query('stock=="disney" or (stock=="nike" and close < 90)')
```

	date	stock	close
0	2019-07-01	disney	143.009995
1	2019-08-01	disney	137.259995
2	2019-09-01	disney	130.320007
3	2019-10-01	disney	129.919998
4	2019-11-01	disney	151.580002
5	2019-07-01	nike	86.029999
6	2019-08-01	nike	84.5
8	2019-10-01	nike	89.550003

Let's practice!

JOINING DATA WITH PANDAS

Reshaping data with `.melt()`

JOINING DATA WITH PANDAS



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Wide versus long data

Wide Format

	first	last	height	weight
0	John	Doe	5.5	130
1	Mary	Bo	6.0	150

Long Format

	first	last	variable	value
0	John	Doe	height	5.5
1	Mary	Bo	height	6.0
2	John	Doe	weight	130
3	Mary	Bo	weight	150

What does the .melt() method do?

- The melt method will allow us to unpivot our dataset

	first	last	height	weight
0	John	Doe	5.5	130
1	Mary	Bo	6.0	150



	first	last	variable	value
0	John	Doe	height	5.5
1	Mary	Bo	height	6.0
2	John	Doe	weight	130
3	Mary	Bo	weight	150

Dataset in wide format

This table is called `social_fin`

	financial	company	2019	2018	2017	2016
0	total_revenue	twitter	3459329	3042359	2443299	2529619
1	gross_profit	twitter	2322288	2077362	1582057	1597379
2	net_income	twitter	1465659	1205596	-108063	-456873
3	total_revenue	facebook	70697000	55838000	40653000	27638000
4	gross_profit	facebook	57927000	46483000	35199000	23849000
5	net_income	facebook	18485000	22112000	15934000	10217000

Example of .melt()

```
social_fin_tall = social_fin.melt(id_vars=['financial', 'company'])  
print(social_fin_tall.head(10))
```

	financial	company	variable	value
0	total_revenue	twitter	2019	3459329
1	gross_profit	twitter	2019	2322288
2	net_income	twitter	2019	1465659
3	total_revenue	facebook	2019	70697000
4	gross_profit	facebook	2019	57927000
5	net_income	facebook	2019	18485000
6	total_revenue	twitter	2018	3042359
7	gross_profit	twitter	2018	2077362
8	net_income	twitter	2018	1205596
9	total_revenue	facebook	2018	55838000

Melting with value_vars

```
social_fin_tall = social_fin.melt(id_vars=['financial', 'company'],  
                                 value_vars=['2018', '2017'])  
  
print(social_fin_tall.head(9))
```

	financial	company	variable	value
0	total_revenue	twitter	2018	3042359
1	gross_profit	twitter	2018	2077362
2	net_income	twitter	2018	1205596
3	total_revenue	facebook	2018	55838000
4	gross_profit	facebook	2018	46483000
5	net_income	facebook	2018	22112000
6	total_revenue	twitter	2017	2443299
7	gross_profit	twitter	2017	1582057
8	net_income	twitter	2017	-108063

Melting with column names

```
social_fin_tall = social_fin.melt(id_vars=['financial', 'company'],  
                                 value_vars=['2018', '2017'],  
                                 var_name='year', value_name='dollars')  
  
print(social_fin_tall.head(8))
```

	financial	company	year	dollars
0	total_revenue	twitter	2018	3042359
1	gross_profit	twitter	2018	2077362
2	net_income	twitter	2018	1205596
3	total_revenue	facebook	2018	55838000
4	gross_profit	facebook	2018	46483000
5	net_income	facebook	2018	22112000
6	total_revenue	twitter	2017	2443299
7	gross_profit	twitter	2017	1582057

Let's practice!

JOINING DATA WITH PANDAS

Course wrap-up

JOINING DATA WITH PANDAS



Aaren Stubberfield
Instructor

You're this high performance race car now



¹ Photo by jae park from Pexels

Data merging basics

- Inner join using `.merge()`
- One-to-one and one-to-many relationships
- Merging multiple tables

Merging tables with different join types

- Inner join using `.merge()`
- One-to-one and one-to-many relationships
- Merging multiple tables
- Left, right, and outer joins
- Merging a table to itself and merging on indexes

Advanced merging and concatenating

- Inner join using `.merge()`
- One-to-one and one-to-many relationships
- Merging multiple tables
- Left, right, and outer joins
- Merging a table to itself and merging on indexes
- **Filtering joins**
 - semi and anti joins
- Combining data vertically with `.concat()`
- Verify data integrity

Merging ordered and time-series data

- Inner join using `.merge()`
- One-to-one and one-to-one relationships
- Merging multiple tables
- Left, right, and outer joins
- Merging a table to itself and merging on indexes
- Filtering joins
 - semi and anti joins
- Combining data vertically with `.concat()`
- Verify data integrity
- Ordered data
 - `merge_ordered()` and `merge_asof()`
- Manipulating data with `.melt()`

Thank you!

JOINING DATA WITH PANDAS