Reading multiple data files

MERGING DATAFRAMES WITH PANDAS

Anaconda
Instructor

Tools for pandas data import

- `pd.read_csv()` for CSV files
- `dataframe = pd.read_csv(filepath)`
- dozens of optional input parameters
- Other data import tools:
  - `pd.read_excel()`
  - `pd.read_html()`
  - `pd.read_json()`

Loading separate files

```
import pandas as pd

dataframe0 = pd.read_csv('sales-jan-2015.csv')

dataframe1 = pd.read_csv('sales-feb-2015.csv')
```

Using a loop

```
filenames = ['sales-jan-2015.csv', 'sales-feb-2015.csv']

dataframes = []

for f in filenames:
        dataframes.append(pd.read_csv(f))
```

Using a comprehension

```
filenames = ['sales-jan-2015.csv', 'sales-feb-2015.csv']

dataframes = [pd.read_csv(f) for f in filenames]
```

Using glob

```
from glob import glob

filenames = glob('sales*.csv')

dataframes = [pd.read_csv(f) for f in filenames]
```

Let's practice!

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Reindexing DataFrames

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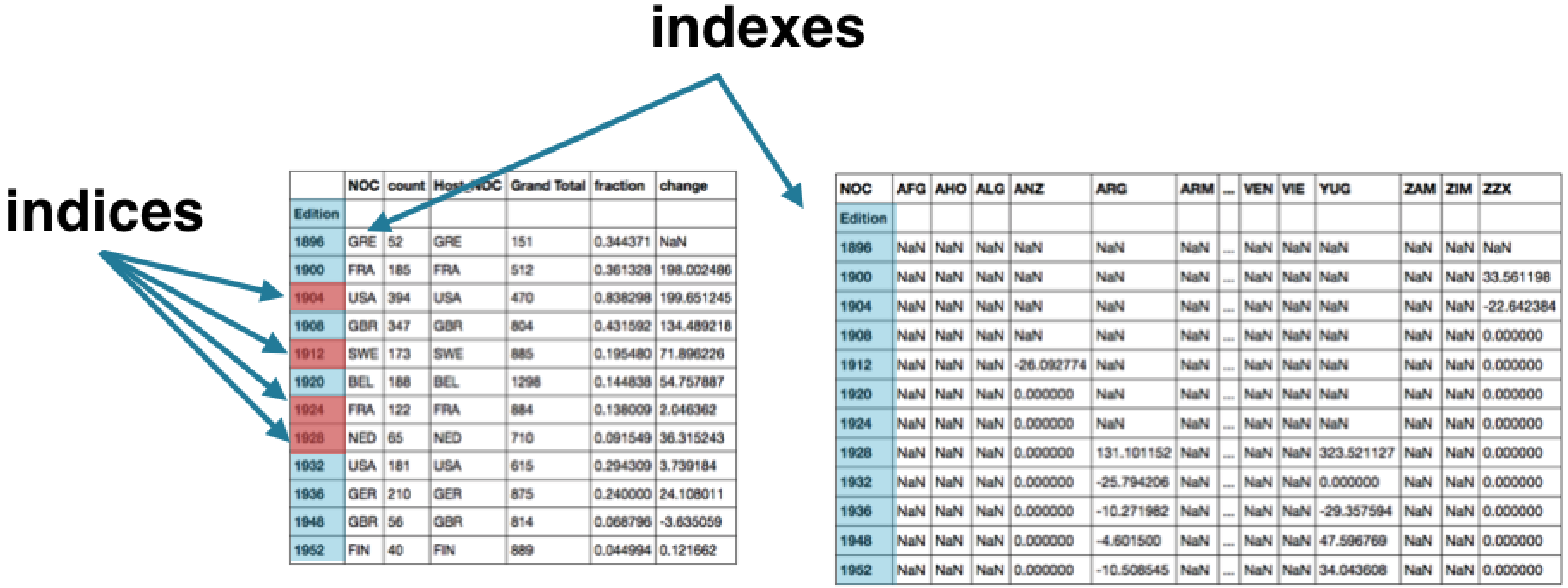
"Indexes" vs. "Indices"

- indices: many index labels within `Index` data structures
- indexes: many pandas `Index` data structures



	NOC	count	Host_NOC	Grand Total	fraction	change
Edition						
1896	GRE	52	GRE	151	0.344371	NaN
1900	FRA	185	FRA	512	0.361328	198.002486
1904	USA	394	USA	470	0.838298	199.651245
1908	GBR	347	GBR	804	0.431592	134.489218
1912	SWE	173	SWE	885	0.195480	71.896226
1920	BEL	188	BEL	1298	0.144838	54.757887
1924	FRA	122	FRA	884	0.138009	2.046362
1928	NED	65	NED	710	0.091549	36.315243
1932	USA	181	USA	615	0.294309	3.739184
1936	GER	210	GER	875	0.240000	24.108011
1948	GBR	56	GBR	814	0.068796	-3.635059
1952	FIN	40	FIN	889	0.044994	0.121662

NOC	AFG	AHO	ALG	ANZ	ARG	ARM	...	VEN	VIE	YUG	ZAM	ZIM	ZZX
Edition													
1896	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN
1900	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	33.561198
1904	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	-22.642384
1908	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	0.000000
1912	NaN	NaN	NaN	-26.092774	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	0.000000
1920	NaN	NaN	NaN	0.000000	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	0.000000
1924	NaN	NaN	NaN	0.000000	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	0.000000
1928	NaN	NaN	NaN	0.000000	131.101152	NaN	...	NaN	NaN	323.521127	NaN	NaN	0.000000
1932	NaN	NaN	NaN	0.000000	-25.794206	NaN	...	NaN	NaN	0.000000	NaN	NaN	0.000000
1936	NaN	NaN	NaN	0.000000	-10.271982	NaN	...	NaN	NaN	-29.357594	NaN	NaN	0.000000
1948	NaN	NaN	NaN	0.000000	-4.601500	NaN	...	NaN	NaN	47.596769	NaN	NaN	0.000000
1952	NaN	NaN	NaN	0.000000	-10.508545	NaN	...	NaN	NaN	34.043608	NaN	NaN	0.000000

Importing weather data

```
import pandas as pd
w_mean = pd.read_csv('quarterly_mean_temp.csv', index_col='Month')
w_max = pd.read_csv('quarterly_max_temp.csv', index_col='Month')
```

Examining the data

```
print(w_mean)
```

```
       Mean TemperatureF
Month
Apr            61.956044
Jan            32.133333
Jul            68.934783
Oct            43.434783
```

```
print(w_max)
```

```
       Max TemperatureF
Month
Jan                  68
Apr                  89
Jul                  91
Oct                  84
```

The DataFrame indexes

```
print(w_mean.index)
```

```
Index(['Apr', 'Jan', 'Jul', 'Oct'], dtype='object', name='Month')
```

```
print(w_max.index)
```

```
Index(['Jan', 'Apr', 'Jul', 'Oct'], dtype='object', name='Month')
```

```
print(type(w_mean.index))
```

```
<class 'pandas.indexes.base.Index'>
```

Using .reindex()

```
ordered = ['Jan', 'Apr', 'Jul', 'Oct']
w_mean2 = w_mean.reindex(ordered)
print(w_mean2)
```

```
       Mean TemperatureF
Month
Jan            32.133333
Apr            61.956044
Jul            68.934783
Oct            43.434783
```

Using .sort_index()

```
w_mean2.sort_index()
```

```
       Mean TemperatureF
Month
Apr            61.956044
Jan            32.133333
Jul            68.934783
Oct            43.434783
```

Reindex from a DataFrame Index

```
w_mean.reindex(w_max.index)
```

```
       Mean TemperatureF
Month
Jan             32.133333
Apr             61.956044
Jul             68.934783
Oct             43.434783
```

Reindexing with missing labels

```
w_mean3 = w_mean.reindex(['Jan', 'Apr', 'Dec'])
print(w_mean3)
```

```
       Mean TemperatureF
Month
Jan             32.133333
Apr             61.956044
Dec                   NaN
```

Reindex from a DataFrame Index

```
w_max.reindex(w_mean3.index)
```

```
       Max TemperatureF
Month
Jan                68.0
Apr                89.0
Dec                 NaN
```

```
w_max.reindex(w_mean3.index).dropna()
```

```
       Max TemperatureF
Month
Jan                68.0
Apr                89.0
```

Order matters

```
w_max.reindex(w_mean.index)
```

```
       Max TemperatureF
Month
Apr                  89
Jan                  68
Jul                  91
Oct                  84
```

```
w_mean.reindex(w_max.index)
```

```
       Mean TemperatureF
Month
Jan            32.133333
Apr            61.956044
Jul            68.934783
Oct            43.434783
```

Let's practice!

MERGING DATAFRAMES WITH PANDAS

Arithmetic with Series & DataFrames

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Loading weather data

```python
import pandas as pd
weather = pd.read_csv('pittsburgh2013.csv',
                          index_col='Date', parse_dates=True)

weather.loc['2013-7-1':'2013-7-7', 'PrecipitationIn']
```

```
Date
2013-07-01    0.18
2013-07-02    0.14
2013-07-03    0.00
2013-07-04    0.25
2013-07-05    0.02
2013-07-06    0.06
2013-07-07    0.10
Name: PrecipitationIn, dtype: float64
```

Scalar multiplication

```
weather.loc['2013-07-01':'2013-07-07', 'PrecipitationIn'] * 2.54
```

```
Date
2013-07-01    0.4572
2013-07-02    0.3556
2013-07-03    0.0000
2013-07-04    0.6350
2013-07-05    0.0508
2013-07-06    0.1524
2013-07-07    0.2540
Name: PrecipitationIn, dtype: float64
```

Absolute temperature range

```
week1_range = weather.loc['2013-07-01':'2013-07-07',
                          ['Min TemperatureF', 'Max TemperatureF']]

print(week1_range)
```

```
            Min TemperatureF  Max TemperatureF
Date
2013-07-01                66                79
2013-07-02                66                84
2013-07-03                71                86
2013-07-04                70                86
2013-07-05                69                86
2013-07-06                70                89
2013-07-07                70                77
```

Average temperature

```
week1_mean = weather.loc['2013-07-01':'2013-07-07',
                         'Mean TemperatureF']

print(week1_mean)
```

```
Date
2013-07-01    72
2013-07-02    74
2013-07-03    78
2013-07-04    77
2013-07-05    76
2013-07-06    78
2013-07-07    72
Name: Mean TemperatureF, dtype: int64
```

Relative temperature range

```
week1_range / week1_mean
```

```
RuntimeWarning: Cannot compare type 'Timestamp' with type 'str',
sort order is undefined for incomparable objects
  return this.join(other, how=how, return_indexers=return_indexers)

            2013-07-01 00:00:00  2013-07-02 00:00:00  2013-07-03 00:00:00  \\
Date
2013-07-01                  NaN                  NaN                  NaN
2013-07-02                  NaN                  NaN                  NaN
2013-07-03                  NaN                  NaN                  NaN
2013-07-04                  NaN                  NaN                  NaN
2013-07-05                  NaN                  NaN                  NaN
2013-07-06                  NaN                  NaN                  NaN
2013-07-07                  NaN                  NaN                  NaN
            2013-07-04 00:00:00  2013-07-05 00:00:00  2013-07-06 00:00:00  \\
Date
2013-07-01                  NaN                  NaN                  NaN
... ...
```

Relative temperature range

```
week1_range.divide(week1_mean, axis='rows')
```

```
            Min TemperatureF  Max TemperatureF
Date
2013-07-01          0.916667          1.097222
2013-07-02          0.891892          1.135135
2013-07-03          0.910256          1.102564
2013-07-04          0.909091          1.116883
2013-07-05          0.907895          1.131579
2013-07-06          0.897436          1.141026
2013-07-07          0.972222          1.069444
```

Percentage changes

```
week1_mean.pct_change() * 100
```

```
Date
2013-07-01          NaN
2013-07-02     2.777778
2013-07-03     5.405405
2013-07-04    -1.282051
2013-07-05    -1.298701
2013-07-06     2.631579
2013-07-07    -7.692308
Name: Mean TemperatureF, dtype: float64
```

Bronze Olympic medals

```
bronze = pd.read_csv('bronze_top5.csv', index_col=0)
print(bronze)
```

```
                  Total
Country
United States    1052.0
Soviet Union      584.0
United Kingdom    505.0
France            475.0
Germany           454.0
```

Silver Olympic medals

```
silver = pd.read_csv('silver_top5.csv', index_col=0)
print(silver)
```

```
                 Total
Country
United States   1195.0
Soviet Union     627.0
United Kingdom   591.0
France           461.0
Italy            394.0
```

Gold Olympic medals

```python
gold = pd.read_csv('gold_top5.csv', index_col=0)
print(gold)
```

```
                 Total
Country
United States   2088.0
Soviet Union     838.0
United Kingdom   498.0
Italy            460.0
Germany          407.0
```

Adding bronze, silver

```
bronze + silver
```

```
Country
France             936.0
Germany              NaN
Italy                NaN
Soviet Union      1211.0
United Kingdom    1096.0
United States     2247.0
Name: Total, dtype: float64
```

Adding bronze, silver

```
bronze + silver
```

```
Country
France             936.0
Germany              NaN
Italy                NaN
Soviet Union      1211.0
United Kingdom    1096.0
United States     2247.0
Name: Total, dtype: float64
```

```
print(bronze['United States'])
```

```
1052.0
```

```
print(silver['United States'])
```

```
1195.0
```

Using the .add() method

```
bronze.add(silver)
```

```
Country
France             936.0
Germany              NaN
Italy                NaN
Soviet Union      1211.0
United Kingdom    1096.0
United States     2247.0
Name: Total, dtype: float64
```

Using a fill_value

```
bronze.add(silver, fill_value=0)
```

```
Country
France             936.0
Germany            454.0
Italy              394.0
Soviet Union      1211.0
United Kingdom    1096.0
United States     2247.0
Name: Total, dtype: float64
```

Adding bronze, silver, gold

```
bronze + silver + gold
```

```
Country
France                 NaN
Germany                NaN
Italy                  NaN
Soviet Union        2049.0
United Kingdom      1594.0
United States       4335.0
Name: Total, dtype: float64
```

Chaining .add()

```
bronze.add(silver, fill_value=0).add(gold, fill_value=0)
```

```
Country
France              936.0
Germany             861.0
Italy               854.0
Soviet Union       2049.0
United Kingdom     1594.0
United States      4335.0
Name: Total, dtype: float64
```

Let's practice!

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