CLEANING DATA IN PYTHON

Tidy data

Tidy data

- “Tidy Data” paper by Hadley Wickham, PhD
- Formalize the way we describe the shape of data
- Gives us a goal when formatting our data
- “Standard way to organize data values within a dataset”

Motivation for tidy data

	name	treatment a	treatment b
0	Daniel	-	42
1	John	12	31
2	Jane	24	27

	0	1	2
name	Daniel	John	Jane
treatment a	-	12	24
treatment b	42	31	27

Principles of tidy data

3 rules

- Columns represent separate variables
- Rows represent individual observations
- Observational units form tables

	name	treatment a	treatment b
0	Daniel	-	42
1	John	12	31
2	Jane	24	27

Converting to tidy data

	name	treatment a	treatment b
0	Daniel	-	42
1	John	12	31
2	Jane	24	27

	name	treatment	value
0	Daniel	treatment a	-
1	John	treatment a	12
2	Jane	treatment a	24
3	Daniel	treatment b	42
4	John	treatment b	31
5	Jane	treatment b	27

in treatment data, columns do not represent separate variable, they represent different values for the variable treatment.

may be strange, and some may argue that the information is harder to ingest bc it is not as easy to compare treatment differences for a particular person.

- Better for reporting vs. better for analysis
- Tidy data makes it easier to fix common data problems

Converting to tidy data

- The data problem we are trying to fix:
  - Columns containing values, instead of variables
- Solution: pd.melt()

Melting

```
In [1]: pd.melt(frame=df, id_vars='name',
   ...:         value_vars=['treatment a', 'treatment b'])
Out[1]:
    name       variable  value
0  Daniel  treatment a      _
1    John  treatment a     12
2    Jane  treatment a     24
3  Daniel  treatment b     42
4    John  treatment b     31
5    Jane  treatment b     27
```

id_vars (names of people to be fixed)
value_vars (specify which columns u want to melt)

Melting

```
In [2]: pd.melt(frame=df, id_vars='name',
   ...:         value_vars=['treatment a', 'treatment b’],
   ...:         var_name='treatment', value_name='result')
Out[2]:
     name     treatment  result
0  Daniel  treatment a       _
1    John  treatment a      12
2    Jane  treatment a      24
3  Daniel  treatment b      42
4    John  treatment b      31
5    Jane  treatment b      27
```

CLEANING DATA IN PYTHON

Let’s practice!

CLEANING DATA IN PYTHON

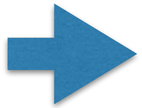
Pivoting data

Pivot: un-melting data

- Opposite of melting
- In melting, we turned columns into rows
- Pivoting: turn unique values into separate columns
- Analysis friendly shape to reporting friendly shape
- Violates tidy data principle: rows contain observations
    - Multiple variables stored in the same column

Pivot: un-melting data

	date	element	value
0	2010-01-30	tmax	27.8
1	2010-01-30	tmin	14.5
2	2010-02-02	tmax	27.3
3	2010-02-02	tmin	14.4



element	tmax	tmin
date		
2010-01-30	27.8	14.5
2010-02-02	27.3	14.4

Pivot

```
In [1]: weather_tidy = weather.pivot(index='date',
   ...:                              columns='element',
   ...:                              values='value')

In [2]: print(weather_tidy)
element     tmax tmin
date
2010-01-30  27.8 14.5
2010-02-02  27.3 14.4
```

Pivot

	date	element	value
0	2010-01-30	tmax	27.8
1	2010-01-30	tmin	14.5
2	2010-02-02	tmax	27.3
3	2010-02-02	tmin	14.4

	date	element	value
0	2010-01-30	tmax	27.8
1	2010-01-30	tmin	14.5
2	2010-02-02	tmax	27.3
3	2010-02-02	tmin	14.4
4	2010-02-02	tmin	16.4

Using pivot when you have duplicate entries

```
In [3]: import numpy as np

In [4]: weather2_tidy = weather.pivot(values='value',
   ...:                               index='date',
   ...:                               columns='element')
Out[4]:
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-9-2962bb23f5a3> in <module>()
      1 weather2_tidy = weather2.pivot(values='value',
      2                                index='date',
----> 3                                columns='element')
ValueError: Index contains duplicate entries, cannot reshape
```

Pivot table

- Has a parameter that specifies how to deal with duplicate values
- Example: Can aggregate the duplicate values by taking their average

Pivot table

```
In [5]: weather2_tidy = weather.pivot_table(values='value',
   ...:                                     index='date',
   ...:                                     columns='element',
   ...:                                     aggfunc=np.mean)
Out[5]:
element      tmax  tmin
date
2010-01-30   27.8  14.5
2010-02-02   27.3  15.4
```

CLEANING DATA IN PYTHON

Let’s practice!

CLEANING DATA IN PYTHON

Beyond melt and pivot

Beyond melt and pivot

- Melting and pivoting are basic tools
- Another common problem:
  - Columns contain multiple bits of information

Beyond melt and pivot

	country	year	m014	m1524
0	AD	2000	0	0
1	AE	2000	2	4
2	AF	2000	52	228

m014 : male from 0-14

m1524: male from 15-24

Melting and parsing

```
In [1]: pd.melt(frame=tb, id_vars=['country', 'year'])
Out[1]:
   country   year variable value
0       AD  2000     m014     0
1       AE  2000     m014     2
2       AF  2000     m014    52
3       AD  2000    m1524     0
4       AE  2000    m1524     4
5       AF  2000    m1524   228
```

- Nothing inherently wrong about original data shape
- Not conducive for analysis bc we would not be able to fit a model where age and sex are independent predictors

Melting and parsing

```
In [2]: tb_melt['sex'] = tb_melt.variable.str[0]
```

treat column as a string

```
In [3]: tb_melt
Out[3]:
   country   year variable value sex
0       AD  2000      m014     0   m
1       AE  2000      m014     2   m
2       AF  2000      m014    52   m
3       AD  2000     m1524     0   m
4       AE  2000     m1524     4   m
5       AF  2000     m1524   228   m
```

CLEANING DATA IN PYTHON

Let’s practice!