Data Wrangling with pandas Cheat Sheet

BecomingHuman.AI

Syntax Creating DataFrames

	a	b	c
1	4	7	10
2	5	8	11
3	6	9	12

```
df = pd.DataFrame(
            {"a" : [4 ,5, 6],
             "b" : [7, 8, 9],
             "c" : [10, 11, 12]},
index = [1, 2, 3])
```

Specify values for each column.

```
df = pd.DataFrame(
      [[4, 7, 10],
       [5, 8, 11],
       [6, 9, 12]],
     index=[1, 2, 3],
     columns=['a', 'b', 'c'])
```

Specify values for each row.

		a	b	c
n	v			
d	1	4	7	10
	2	5	8	11
e	2	6	9	12

```
df = pd.DataFrame(
            {"a" : [4 ,5, 6],
             "b" : [7, 8, 9],
             "c" : [10, 11, 12]},
index = pd.MultiIndex.from_tuples(
            [('d',1),('d',2),('e',2)],
              names=['n','v']))
```

Create DataFrame with a MultiIndex

Method Chaining

Most pandas methods return a DataFrame so that another pandas method can be applied to the result. This improves readability of code.

```
df = (pd.melt(df)
        .rename(columns={
                  'variable' : 'var',
                  'value' : 'val'})
        .query('val >= 200')
)
```

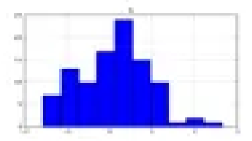
Windows

df.expanding()
Return an Expanding object allowing summary functions to be applied cumulatively.

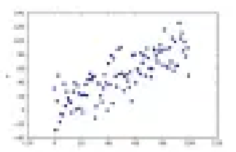
df.rolling(n)
Return a Rolling object allowing summary functions to be applied to windows of length n.

Windows

df.plot.hist()
Histogram for each column

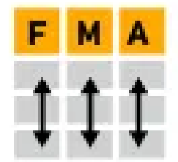


df.plot.scatter(x='w',y='h')
Scatter chart using pairs of points



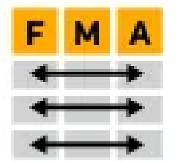
Tidy Data A foundation for wrangling in pandas

In a tidy data set:



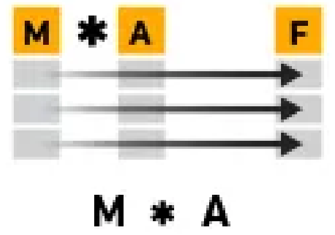
Each **variable** is saved in its own **column**

&

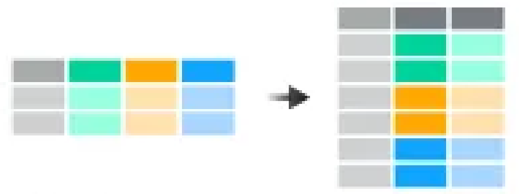


Each **observation** is saved in its own **row**

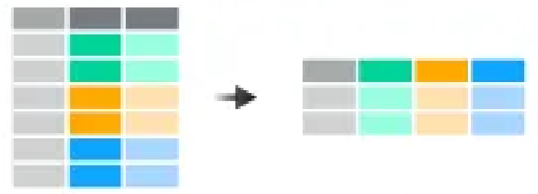
Tidy data complements pandas's vectorized operations. pandas will automatically preserve observations as you manipulate variables. No other format works as intuitively with pandas



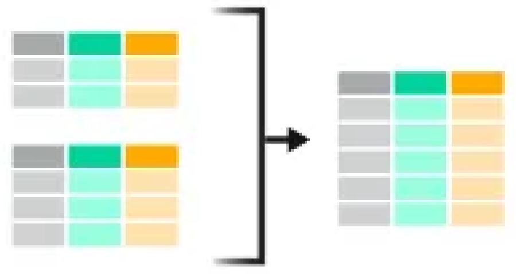
Reshaping Data Change the layout of a data set



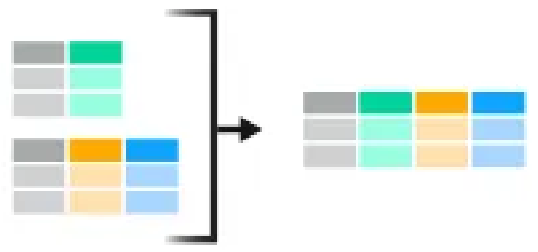
pd.melt(df)
Gather columns into rows.



df.pivot(columns='var', values='val')
Spread rows into columns.



pd.concat([df1,df2])
Append rows of DataFrames



pd.concat([df1,df2], axis=1)
Append columns of DataFrames

df.sort_values('mpg')
Order rows by values of a column (low to high).

df.sort_values('mpg',ascending=False)
Order rows by values of a column (high to low).

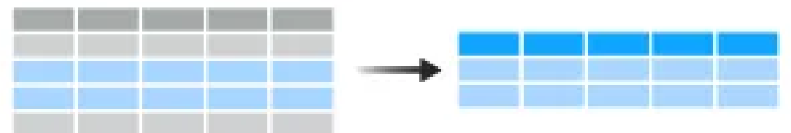
df.rename(columns = {'y':'year'})
Rename the columns of a DataFrame

df.sort_index()
Sort the index of a DataFrame

df.reset_index()
Reset index of DataFrame to row numbers, moving index to columns.

df.drop(columns=['Length','Height'])
Drop columns from DataFrame

Subset Observations (Rows)



df[df.Length > 7]
Extract rows that meet logical criteria.

df.drop_duplicates()
Remove duplicate rows (only considers columns).

df.head(n)
Select first n rows.

df.tail(n)
Select last n rows.

df.sample(frac=0.5)
Randomly select fraction of rows.

df.sample(n=10)
Randomly select n rows.

df.iloc[10:20]
Select rows by position.

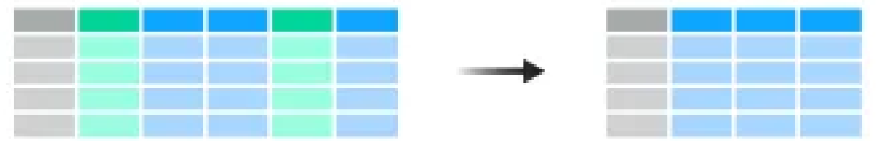
df.nlargest(n, 'value')
Select and order top n entries.

df.nsmallest(n, 'value')
Select and order bottom n entries.

Logic in Python (and pandas)

<	Less than	!=	Not equal to
>	Greater than	df.column.isin(values)	Group membership
==	Equal to	pd.isnull(obj)	Is NaN
<=	Less than or equal to	pd.notnull(obj)	Is not NaN
>=	Greater than or equal to	&,|,~,^,df.any(),df.all(	Logical and, or, not, xor, any, all

Subset Variables (Columns)



df[['width','length','species']]
Select multiple columns with specific names.

df['width'] or df.width
Select single column with specific name.

df.filter(regex='regex')
Select columns whose name matches regular expression regex.

Logic in Python (and pandas)

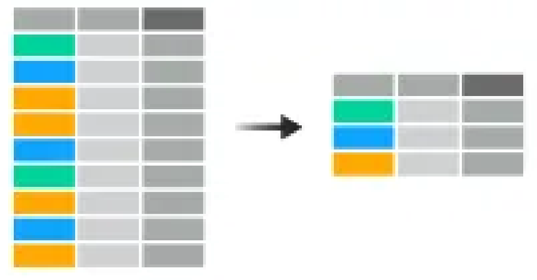
'\.'	Matches strings containing a period '.'
'Length$	Matches strings ending with word 'Length'
'^Sepal'	Matches strings beginning with the word 'Sepal'
'^x[1-5]$'	Matches strings beginning with 'x' and ending with 1,2,3,4,5
'^(?!Species$).*'	Matches strings except the string 'Species'

df.loc[:,'x2':'x4']
Select all columns between x2 and x4 (inclusive).

df.iloc[:,[1,2,5]]
Select columns in positions 1, 2 and 5 (first column is 0).

df.loc[df['a'] > 10, ['a','c']]
Select rows meeting logical condition, and only the specific columns .

Windows



df.groupby(by="col")
Return a GroupBy object, grouped by values in column named "col".

df.groupby(level="ind")
Return a GroupBy object, grouped by values in index level named "ind".

All of the summary functions listed above can be applied to a group. Additional GroupBy functions:

size()
Size of each group.

agg(function)
Aggregate group using function.

The examples below can also be applied to groups. In this case, the function is applied on a per-group basis, and the returned vectors are of the length of the original DataFrame.

shift(1)
Copy with values shifted by 1.

rank(method='dense')
Ranks with no gaps.

rank(method='min')
Ranks. Ties get min rank.

rank(pct=True)
Ranks rescaled to interval [0, 1].

rank(method='first')
Ranks. Ties go to first value.

shift(-1)
Copy with values lagged by 1.

cumsum()
Cumulative sum.

cummax()
Cumulative max.

cummin()
Cumulative min.

cumprod()
Cumulative product

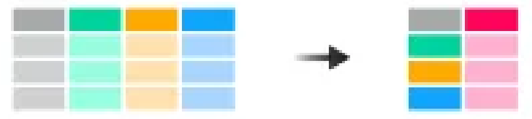
Summarise Data

df['w'].value_counts()
Count number of rows with each unique value of variable

len(df)
# of rows in DataFrame.

df['w'].nunique()
# of distinct values in a column.

df.describe()
Basic descriptive statistics for each column (or GroupBy)



pandas provides a large set of **summary functions** that operate on different kinds of pandas objects (DataFrame columns, Series, GroupBy, Expanding and Rolling (see below)) and produce single values for each of the groups. When applied to a DataFrame, the result is returned as a pandas Series for each column. Examples:

sum()
Sum values of each object.

count()
Count non-NA/null values of each object.

median()
Median value of each object.

quantile([0.25,0.75])
Quantiles of each object.

apply(function)
Apply function to each object

min()
Minimum value in each object.

max()
Maximum value in each object.

mean()
Mean value of each object.

var()
Variance of each object.

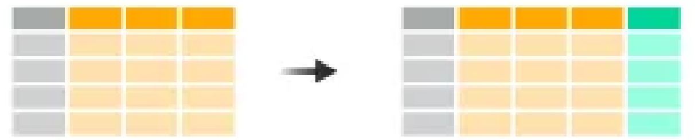
std()
Standard deviation of each object.

Handling Missing Data

df.dropna()
Drop rows with any column having NA/null data.

df.fillna(value)

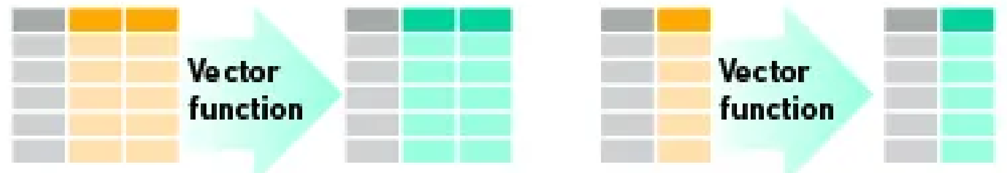
Make New Columns



df.assign(Area=lambda df: df.Length*df.Height)
Compute and append one or more new columns.

df['Volume'] = df.Length*df.Height*df.Depth
Add single column.

pd.qcut(df.col, n, labels=False)
Bin column into n buckets.



pandas provides a large set of vector functions that operate on allcolumns of a DataFrame or a single selected column (a pandas Series). These functions produce vectors of values for each of the columns, or a single Series for the individual Series. Examples:

max(axis=1)
Element-wise max.

min(axis=1)
Element-wise min.

clip(lower=-10,upper=10)
Trim values at input thresholds

abs()
Absolute value.

Combine Data Sets

ydf

x1	x2
A	1
B	2
C	3

+ zdf

x1	x2
B	2
C	3
D	4

=

Set Operations

x1	x2
B	2
C	3

pd.merge(ydf, zdf)
Rows that appear in both ydf and zdf (Intersection).

x1	x2
A	1
B	2
C	3
D	4

pd.merge(ydf, zdf, how='outer')
Rows that appear in either or both ydf and zdf (Union).

x1	x2
A	1

```
pd.merge(ydf, zdf, how='outer',
              indicator=True)
              .query('_merge == "left_only"')
             .drop(columns=['_merge'])
```

Rows that appear in ydf but not zdf (Setdiff)

adf

x1	x2
A	1
B	2
C	3

+ bdf

x1	x3
A	T
B	F
C	T

=

Standard Joins

x1	x2	x3
A	1	T
B	2	F
C	3	NaN

dpd.merge(adf, bdf, how='left', on='x1')
Join matching rows from bdf to adf.

x1	x2	x3
A	1.0	T
B	2.0	F
D	NaN	T

pd.merge(adf, bdf, how='right', on='x1')
Join matching rows from adf to bdf.

x1	x2	x3
A	1	T
B	2	F

pd.merge(adf, bdf, how='inner', on='x1')
Join data. Retain only rows in both sets.

x1	x2	x3
A	1	T
B	2	F
C	3	NaN
D	NaN	T

pd.merge(adf, bdf, how='outer', on='x1')
Join data. Retain all values, all rows.

Filtering Joins

x1	x2
A	1
B	2

adf[adf.x1.isin(bdf.x1)]
All rows in adf that have a match in bdf.

x1	x2
C	3

adf[~adf.x1.isin(bdf.x1)]
All rows in adf that do not have a match in bdf