Pandas

Data analysis with Pandas

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Creating, Reading and Writing

DataFrame and Series

```
import pandas as pd
```

2 core objects- - DataFrame - array of inidividual entries (contains row and column)

keys = 'column names', values = list of entries

rows = **Index**

- Series- sequence of data values

  don't have any column name

  row names defined by **index** parameter aswell

```
#DataFrame_integer
pd.DataFrame({'Yes' : [390, 233], 'No' : [1,23]})
```

	Yes	No
0	390	1
1	233	23

```
# DataFrame_Strings
pd.DataFrame({'Suzaine': ['I liked chocolate', 'Lets have some fun'],
              'Marie': ['butterscotch worked fine', 'wow, its raining']},
             index = ['topic_1', 'topic_2'])
```

	Suzaine	Marie
topic_1	I liked chocolate	butterscotch worked fine
topic_2	Lets have some fun	wow, its raining

```
# series
pd.Series([1, 2, 3],
index= ['2014_sales', '2015_sales', '2016_sales'],
name = 'Product A')
```

```
2014_sales    1
2015_sales    2
2016_sales    3
Name: Product A, dtype: int64
```

```
# example
Dinner = pd.Series(['4 cups', '1 cup', '2 large', '1 can'],
         index = ['Flour', 'Milk', 'Eggs', 'Spam'],
         name = 'Dinner')
print(Dinner)
```

```
Flour     4 cups
Milk       1 cup
Eggs     2 large
Spam       1 can
Name: Dinner, dtype: object
```

Writing data files

```
Dinner.to_csv("Dinner.csv")
```

Reading data files

```
reactions = pd.read_csv('Reactions.csv')
print(reactions.shape)
```

```
(25553, 5)
```

```
print(reactions.head())
```

```
   Unnamed: 0                            Content ID  \
0           0  97522e57-d9ab-4bd6-97bf-c24d952602d2
1           1  97522e57-d9ab-4bd6-97bf-c24d952602d2
2           2  97522e57-d9ab-4bd6-97bf-c24d952602d2
3           3  97522e57-d9ab-4bd6-97bf-c24d952602d2
4           4  97522e57-d9ab-4bd6-97bf-c24d952602d2

                                User ID     Type             Datetime
0                                   NaN      NaN  2021-04-22 15:17:15
1  5d454588-283d-459d-915d-c48a2cb4c27f  disgust  2020-11-07 09:43:50
2  92b87fa5-f271-43e0-af66-84fac21052e6  dislike  2021-06-17 12:22:51
3  163daa38-8b77-48c9-9af6-37a6c1447ac2   scared  2021-04-18 05:13:58
4  34e8add9-0206-47fd-a501-037b994650a2  disgust  2021-01-06 19:13:01
```

Indexing, Selecting and Assigning

```
data = pd.read_csv("winemag-data-130k-v2.csv")
pd.set_option('display.max_rows', 5)
print(data.head())
```

```
   Unnamed: 0   country                                        description  \
0           0     Italy  Aromas include tropical fruit, broom, brimston...
```

```
1           1  Portugal  This is ripe and fruity, a wine that is smooth...
2           2        US  Tart and snappy, the flavors of lime flesh and...
3           3        US  Pineapple rind, lemon pith and orange blossom ...
4           4        US  Much like the regular bottling from 2012, this...

                         designation  points  price           province  \
0                       Vulkà Bianco      87    NaN  Sicily & Sardinia
1                           Avidagos      87   15.0              Douro
2                                NaN      87   14.0             Oregon
3                Reserve Late Harvest      87   13.0           Michigan
4  Vintner's Reserve Wild Child Block      87   65.0             Oregon

              region_1           region_2         taster_name  \
0                 Etna                NaN       Kerin O'Keefe
1                  NaN                NaN          Roger Voss
2    Willamette Valley  Willamette Valley        Paul Gregutt
3  Lake Michigan Shore                NaN  Alexander Peartree
4    Willamette Valley  Willamette Valley        Paul Gregutt

  taster_twitter_handle                                                title  \
0          @kerinokeefe                  Nicosia 2013 Vulkà Bianco  (Etna)
1            @vossroger      Quinta dos Avidagos 2011 Avidagos Red (Douro)
2           @paulgwine       Rainstorm 2013 Pinot Gris (Willamette Valley)
3                   NaN  St. Julian 2013 Reserve Late Harvest Riesling ...
4           @paulgwine   Sweet Cheeks 2012 Vintner's Reserve Wild Child...

          variety               winery
0     White Blend              Nicosia
1  Portuguese Red  Quinta dos Avidagos
2      Pinot Gris            Rainstorm
3        Riesling           St. Julian
4      Pinot Noir         Sweet Cheeks
```

```
print(data.columns)
```

```
Index(['Unnamed: 0', 'country', 'description', 'designation', 'points',
       'price', 'province', 'region_1', 'region_2', 'taster_name',
       'taster_twitter_handle', 'title', 'variety', 'winery'],
      dtype='object')
```

```
print(data.country)
```

```
0            Italy
1         Portugal
             ...
129969      France
129970      France
Name: country, Length: 129971, dtype: object
```

```
print(data['country'])  #handles reserved characters
```

```
0            Italy
1         Portugal
             ...
129969      France
129970      France
Name: country, Length: 129971, dtype: object
```

```
print(data['country'][4])
```

```
US
```

Indexing

index based or numerical position based (.iloc operator used)

- python's std. library appraoch (0:10 selects 0, 1, ...9)

label based or value based (.loc operator used)

-indexes inclusively. So 0:10 will select entries 0,...,10

```
# selecting first row
data.iloc[0]
```

```
Unnamed: 0              0
country             Italy
                      ...
variety       White Blend
winery            Nicosia
Name: 0, Length: 14, dtype: object
```

```
data.iloc[:3, 1]
```

```
0       Italy
1    Portugal
2          US
Name: country, dtype: object
```

```
data.iloc[-5:] #selecting last 5 rows, plus all columns
```

	Unnamed: 0	country	description	designation
129966	129966	Germany	Notes of honeysuckle and cantaloupe sweeten th...	Brauneberger Juffer-S
129967	129967	US	Citation is given as much as a decade of bottl...	NaN
129968	129968	France	Well-drained gravel soil gives this wine its c...	Kritt
129969	129969	France	A dry style of Pinot Gris, this is crisp with ...	NaN
129970	129970	France	Big, rich and off-dry, this is powered by inte...	Lieu-dit Harth Cuvée

```
data.loc[:, ['taster_name', 'variety', 'winery']]
```

	taster_name	variety	winery
0	Kerin O'Keefe	White Blend	Nicosia
1	Roger Voss	Portuguese Red	Quinta dos Avidagos
...	...	...	...
129969	Roger Voss	Pinot Gris	Domaine Marcel Deiss
129970	Roger Voss	Gewürztraminer	Domaine Schoffit

Manipulating the index

```
data.set_index('title') #now first column is title
```

title	Unnamed: 0	country	des
Nicosia 2013 Vulkà Bianco (Etna)	0	Italy	Ar
Quinta dos Avidagos 2011 Avidagos Red (Douro)	1	Portugal	Th
...	...	...	...
Domaine Marcel Deiss 2012 Pinot Gris (Alsace)	129969	France	A
Domaine Schoffit 2012 Lieu-dit Harth Cuvée Caroline Gewurztraminer (Alsace)	129970	France	Bi

```
# conditional selection
# selects data with US in columns names for countries
data.loc[data.country == 'US']
```

	Unnamed: 0	country	description	designation
2	2	US	Tart and snappy, the flavors of lime flesh and...	NaN
3	3	US	Pineapple rind, lemon pith and orange blossom ...	Reserve Late Harvest
...	...	...	...	...
129952	129952	US	This Zinfandel from the eastern section of Nap...	NaN
129967	129967	US	Citation is given as much as a decade of bottl...	NaN

```
# selecting particular rows
indices = [1, 2, 3, 5, 8]
sample_rows = data.loc[indices]
print(sample_rows)
```

```
   Unnamed: 0   country                                        description  \
1           1  Portugal  This is ripe and fruity, a wine that is smooth...
2           2        US  Tart and snappy, the flavors of lime flesh and...
3           3        US  Pineapple rind, lemon pith and orange blossom ...
5           5     Spain  Blackberry and raspberry aromas show a typical...
8           8   Germany  Savory dried thyme notes accent sunnier flavor...

            designation  points  price        province             region_1  \
1              Avidagos      50   15.0           Douro                  NaN
```

```
2                   NaN      50   14.0          Oregon    Willamette Valley
3  Reserve Late Harvest      50   13.0        Michigan  Lake Michigan Shore
5          Ars In Vitro      50   15.0  Northern Spain              Navarra
8                 Shine      50   12.0     Rheinhessen                  NaN

           region_2         taster_name taster_twitter_handle  \
1               NaN          Roger Voss            @vossroger
2  Willamette Valley        Paul Gregutt           @paulgwine
3               NaN  Alexander Peartree                   NaN
5               NaN   Michael Schachner           @wineschach
8               NaN  Anna Lee C. Iijima                   NaN

                                                 title             variety  \
1      Quinta dos Avidagos 2011 Avidagos Red (Douro)      Portuguese Red
2      Rainstorm 2013 Pinot Gris (Willamette Valley)          Pinot Gris
3  St. Julian 2013 Reserve Late Harvest Riesling ...            Riesling
5  Tandem 2011 Ars In Vitro Tempranillo-Merlot (N...  Tempranillo-Merlot
8  Heinz Eifel 2013 Shine Gewürztraminer (Rheinhe...      Gewürztraminer

               winery
1  Quinta dos Avidagos
2           Rainstorm
3          St. Julian
5              Tandem
8         Heinz Eifel
```

```python
# selecting costly wines from US
data.loc[(data.country == 'US') & (data.price >= 75)]
```

	Unnamed: 0	country	description	designation
60	60	US	Syrupy and dense, this wine is jammy in plum a...	Estate
73	73	US	Juicy plum, raspberry and pencil lead lead the...	Bella Vetta Vineyard
...	...	...	...	...
129919	129919	US	This ripe, rich, almost decadently thick wine ...	Reserve
129967	129967	US	Citation is given as much as a decade of bottl...	NaN

```python
# wines from Australia and New Zealand
data.loc[
    (data.country.isin(['Australia', 'New Zealand']))
]
```

	Unnamed: 0	country	description	designation
77	77	Australia	This medium-bodied Chardonnay features aromas ...	Made With Org
83	83	Australia	Pale copper in hue, this wine exudes passion f...	Jester Sangioves
...	...	...	...	...
129956	129956	New Zealand	The blend is 44% Merlot, 33% Cabernet Sauvigno...	Gimblett Grave
129958	129958	New Zealand	This blend of Cabernet Sauvignon-Merlot and Ca...	Irongate

```
# selecting rows and columns
columns = ['price', 'region_1', 'region_2']
rows = [1, 10, 100]
df = data.loc[rows, columns]
print(df)
```

```
     price      region_1      region_2
1     15.0           NaN           NaN
10    19.0   Napa Valley          Napa
100   18.0  Finger Lakes  Finger Lakes
```

```
# selecting notnull values
data.loc[data.price.notnull()]
```

	Unnamed: 0	country	description	designation
1	1	Portugal	This is ripe and fruity, a wine that is smooth...	Avidagos
2	2	US	Tart and snappy, the flavors of lime flesh and...	NaN
...	...	...	...	...
129969	129969	France	A dry style of Pinot Gris, this is crisp with ...	NaN
129970	129970	France	Big, rich and off-dry, this is powered by inte...	Lieu-dit Harth Cuvée Car

Assigning data

```
data['points'] = 50
print(data['points'])
```

```
0         50
1         50
```

```
         ..
129969    50
129970    50
Name: points, Length: 129971, dtype: int64
```

Renaming and Combining

```
# renaming columns
print(data.rename(columns={'points' : 'score'}))
```

```
        Unnamed: 0   country  \
0                0     Italy
1                1  Portugal
...            ...       ...
129969      129969    France
129970      129970    France

                                              description  \
0       Aromas include tropical fruit, broom, brimston...
1       This is ripe and fruity, a wine that is smooth...
...                                                   ...
129969  A dry style of Pinot Gris, this is crisp with ...
129970  Big, rich and off-dry, this is powered by inte...

                         designation  score  price           province  \
0                       Vulkà Bianco     87    NaN  Sicily & Sardinia
1                           Avidagos     87   15.0              Douro
...                              ...    ...    ...                ...
129969                           NaN     90   32.0             Alsace
129970  Lieu-dit Harth Cuvée Caroline     90   21.0             Alsace

       region_1 region_2    taster_name taster_twitter_handle  \
0          Etna      NaN  Kerin O'Keefe          @kerinokeefe
1           NaN      NaN     Roger Voss            @vossroger
...         ...      ...            ...                   ...
129969   Alsace      NaN     Roger Voss            @vossroger
129970   Alsace      NaN     Roger Voss            @vossroger

                                              title         variety  \
0                       Nicosia 2013 Vulkà Bianco  (Etna)     White Blend
```

```
1           Quinta dos Avidagos 2011 Avidagos Red (Douro)  Portuguese Red
...                                                   ...             ...
129969      Domaine Marcel Deiss 2012 Pinot Gris (Alsace)      Pinot Gris
129970  Domaine Schoffit 2012 Lieu-dit Harth Cuvée Car...  Gewürztraminer

                    winery
0                  Nicosia
1        Quinta dos Avidagos
...                      ...
129969  Domaine Marcel Deiss
129970      Domaine Schoffit

[129971 rows x 14 columns]
```

```
# renaming indexes
print(data.rename(index={0:'first_entry', 1: 'second_entry'}))
```

```
             Unnamed: 0   country  \
first_entry           0     Italy
second_entry          1  Portugal
...                 ...       ...
129969           129969    France
129970           129970    France

                                                  description  \
first_entry   Aromas include tropical fruit, broom, brimston...
second_entry  This is ripe and fruity, a wine that is smooth...
...                                                         ...
129969        A dry style of Pinot Gris, this is crisp with ...
129970        Big, rich and off-dry, this is powered by inte...

                               designation  points  price           province  \
first_entry                   Vulkà Bianco      87    NaN  Sicily & Sardinia
second_entry                      Avidagos      87   15.0             Douro
...                                    ...     ...    ...               ...
129969                                 NaN      90   32.0            Alsace
129970        Lieu-dit Harth Cuvée Caroline      90   21.0            Alsace

             region_1 region_2    taster_name taster_twitter_handle  \
first_entry      Etna      NaN  Kerin O'Keefe          @kerinokeefe
second_entry      NaN      NaN     Roger Voss            @vossroger
```

```
...              ...      ...            ...                   ...
129969         Alsace      NaN     Roger Voss            @vossroger
129970         Alsace      NaN     Roger Voss            @vossroger

                                                          title  \
first_entry                    Nicosia 2013 Vulkà Bianco  (Etna)
second_entry      Quinta dos Avidagos 2011 Avidagos Red (Douro)
...                                                         ...
129969            Domaine Marcel Deiss 2012 Pinot Gris (Alsace)
129970        Domaine Schoffit 2012 Lieu-dit Harth Cuvée Car...

                     variety                winery
first_entry      White Blend               Nicosia
second_entry  Portuguese Red   Quinta dos Avidagos
...                      ...                   ...
129969            Pinot Gris  Domaine Marcel Deiss
129970        Gewürztraminer      Domaine Schoffit

[129971 rows x 14 columns]
```

```
# renaming axis
data.rename_axis ("wines", axis = 'rows').rename_axis('fields', axis = 'columns')
```

fields wines	Unnamed: 0	country	description	designation
0	0	Italy	Aromas include tropical fruit, broom, brimston...	Vulkà Bianco
1	1	Portugal	This is ripe and fruity, a wine that is smooth...	Avidagos
...	...	...	...	...
129969	129969	France	A dry style of Pinot Gris, this is crisp with ...	NaN
129970	129970	France	Big, rich and off-dry, this is powered by inte...	Lieu-dit Harth Cuvée C

```
# combining with concat(), join(), and merge()
file1 = 'CAvideos.csv'
CAdata = pd.read_csv(file1)
CAdata
```

	video_id	trending_date	title	channel_title
0	n1WpP7iowLc	17.14.11	Eminem - Walk On Water (Audio) ft. Beyoncé	EminemVEVO
1	0dBIkQ4Mz1M	17.14.11	PLUSH - Bad Unboxing Fan Mail	iDubbbzTV

	video_id	trending_date	title	channel_title
...	...	...	...	...
40879	lbMKLzQ4cNQ	18.14.06	Trump Advisor Grovels To Trudeau	The Young Turks
40880	POTgw38-m58	18.14.06	2018.06.13	

```
file2 = 'FRvideos.csv'
FRdata = pd.read_csv(file2)
FRdata
```

	video_id	trending_date	title	channel_tit
0	Ro6eob0LrCY	17.14.11	Malika LePen : Femme de Gauche - Trailer	Le Raptor I
1	Yo84eqYwP98	17.14.11	LA PIRE PARTIE ft Le Rire Jaune, Pierre Croce,...	Le Labo
...	...	...	...	...
40722	NlxE_QQMRzg	18.14.06	, 192 / Pomegranate seed / Nra...	PanArmenia
40723	_LgKglfnqlc	18.14.06	Mandoumbé ak Koor Gui 2018 Episode 28	Yesdakar

```
# joining
left = CAdata.set_index(['title', 'trending_date'])
right = FRdata.set_index(['title', 'trending_date'])

left.join(right, lsuffix= '_CAN', rsuffix = '_FR')
```

title	trending_date	video_
!! THIS VIDEO IS NOTHING BUT PAIN !! | Getting Over It - Part 7	18.04.01	PNn8s
#1 Fortnite World Rank - 2,323 Solo Wins!	18.09.03	DvPW
...	...	...
BREAKING NEWS Raja Live all Slot Channels Welcome	18.07.05	Wt9G
Active Shooter at YouTube Headquarters - LIVE BREAKING NEWS COVERAGE	18.04.04	Az72j

Summary Functions and Maps

```
# some of the summary functions include- describe, mean, unique, value_counts
print(data.columns)
```

```
Index(['Unnamed: 0', 'country', 'description', 'designation', 'points',
       'price', 'province', 'region_1', 'region_2', 'taster_name',
       'taster_twitter_handle', 'title', 'variety', 'winery'],
      dtype='object')
```

```
print(data.points.describe())
```

```
count    129971.000000
mean         88.447138
             ...
75%          91.000000
max         100.000000
Name: points, Length: 8, dtype: float64
```

```
# to see the list of unique values
print(data.taster_name.unique)
```

```
<bound method Series.unique of 0         Kerin O'Keefe
1            Roger Voss
              ...
129969       Roger Voss
129970       Roger Voss
Name: taster_name, Length: 129971, dtype: object>
```

```
print(data.taster_name.value_counts)
```

```
<bound method IndexOpsMixin.value_counts of 0         Kerin O'Keefe
1            Roger Voss
              ...
129969       Roger Voss
129970       Roger Voss
Name: taster_name, Length: 129971, dtype: object>
```

```
# best_bargain_wine- wine with the highest points-to-price ratio
bargain_idx = (data.points / data.price).idxmax()
bargain_wine = data.loc[bargain_idx, 'title']
print(bargain_wine)
```

```
Bandit NV Merlot (California)
```

Maps

- takes one set of values and 'maps' them to another set of values
- example usage - **remean** the scores of wines received to 0
- use **apply** if you wish to call custom method on each row

```
review_points_mean = data.points.mean()
data.points.map(lambda p:p - review_points_mean)
```

```
0        -1.447138
1        -1.447138
            ...
129969    1.552862
129970    1.552862
Name: points, Length: 129971, dtype: float64
```

```
data_points_mean = data.points.mean()
data.points.map(lambda p:p - data_points_mean)
```

```
0        -1.447138
1        -1.447138
            ...
129969    1.552862
129970    1.552862
Name: points, Length: 129971, dtype: float64
```

```
# create descriptor_counts from description for 'tropical' and 'fruity'
n_tropical = data.description.map(lambda desc:'tropical' in desc).sum()
# desc signifies description
n_fruity = data.description.map(lambda desc:'fruity' in desc).sum()
descriptor_counts = pd.Series([n_tropical, n_fruity], index= ['tropical', 'fruity'])
print(descriptor_counts)
```

```
tropical    3607
fruity      9090
dtype: int64
```

simplify with star ratings

- 95 and above = 3 stars
- between 85 and 95 = 2 stars
- less than 85 = 1 star
- plus, any wines from Canada should get 3 stars

```
print(data.columns)
```

```
Index(['Unnamed: 0', 'country', 'description', 'designation', 'points',
       'price', 'province', 'region_1', 'region_2', 'taster_name',
       'taster_twitter_handle', 'title', 'variety', 'winery'],
      dtype='object')
```

```
# categorizing using map for points
cat = data.points.map(lambda
                      p:'three_stars' if  p>=95
                      else 'two stars' if p >= 85
                      else 'one star')

#count
star_rating = cat.value_counts()

print(star_rating)
```

```
points
two stars      115125
one star        12430
three_stars      2416
Name: count, dtype: int64
```

```
# categorizing using apply for points and Country
cat2 = data.apply(lambda row:
                    'three stars' if (row['points'] >= 95 or row['country'] == 'Canada')
                   else 'two stars' if (row['points'] >= 85)
                   else 'one star', axis = 1)
star_rating2 = cat2.value_counts()
print(star_rating2)
```

```
two stars      114877
one star        12421
three stars      2673
Name: count, dtype: int64
```

```
# simple way without mapping
def stars(row):
    if row.country == 'Canada':
        return 3
    elif row.points >= 95:
        return 3
    elif row.points >= 85:
        return 2
    else:
        return 1


star_ratings = data.apply(stars, axis = 'columns')
print(star_ratings)
```

```
0         2
1         2
         ..
129969    2
129970    2
Length: 129971, dtype: int64
```

```
def data_points(row):
    row.points = row.points - data_points_mean
    return row

data.apply(data_points, axis = 'columns')
```

	Unnamed: 0	country	description	designation
0	0	Italy	Aromas include tropical fruit, broom, brimston...	Vulkà Bianco
1	1	Portugal	This is ripe and fruity, a wine that is smooth...	Avidagos
...	...	...	...	...
129969	129969	France	A dry style of Pinot Gris, this is crisp with ...	NaN
129970	129970	France	Big, rich and off-dry, this is powered by inte...	Lieu-dit Harth Cuvée C

```
data.head(1)
```

	Unnamed: 0	country	description	designation	points	price
0	0	Italy	Aromas include tropical fruit, broom, brimston...	Vulkà Bianco	87	NaN

- operation (below) between a lot of values on the **left-hand** side > and a single value on the **right-hand** side (the mean value).

```
data_points_mean = data.points.mean()
data.points - data_points_mean
```

```
0        -1.447138
1        -1.447138
            ...
129969    1.552862
129970    1.552862
Name: points, Length: 129971, dtype: float64
```

```
data.country + "-" + data.region_1
```

```
0            Italy-Etna
1                   NaN
              ...
129969    France-Alsace
129970    France-Alsace
Length: 129971, dtype: object
```

Grouping and Sorting

use groupby to group data

apply() method can fetch us the data that matches the group

```
# groupwise analysis
data.groupby('points').points.count()
```

```
points
80     397
81     692
       ...
99      33
100     19
Name: points, Length: 21, dtype: int64
```

```
# ascending or descending order
data.groupby('points').price.min()
```

```
points
80      5.0
81      5.0
        ...
99     44.0
100    80.0
Name: price, Length: 21, dtype: float64
```

```
#grouping in countries and sorting
data.groupby(['country', 'province']).apply(lambda df:df.loc[df.points.idxmax()])
```

country	province	Unnamed: 0	country	description
Argentina	Mendoza Province	82754	Argentina	If the color doesn't tell the full story, the ...
	Other	78303	Argentina	Take note, this could be the best wine Colomé ...
...	...	...	...	...
Uruguay	San Jose	39898	Uruguay	Baked, sweet, heavy aromas turn earthy with ti...
	Uruguay	39361	Uruguay	Cherry and berry aromas are ripe, healthy and ...

```
help(pd.Series.idxmax)
```

```
Help on function idxmax in module pandas.core.series:

idxmax(self, axis: 'Axis' = 0, skipna: 'bool' = True, *args, **kwargs) -> 'Hashable'
    Return the row label of the maximum value.

    If multiple values equal the maximum, the first row label with that
```

```
value is returned.

Parameters
----------
axis : {0 or 'index'}
    Unused. Parameter needed for compatibility with DataFrame.
skipna : bool, default True
    Exclude NA/null values. If the entire Series is NA, the result
    will be NA.
*args, **kwargs
    Additional arguments and keywords have no effect but might be
    accepted for compatibility with NumPy.

Returns
-------
Index
    Label of the maximum value.

Raises
------
ValueError
    If the Series is empty.

See Also
--------
numpy.argmax : Return indices of the maximum values
    along the given axis.
DataFrame.idxmax : Return index of first occurrence of maximum
    over requested axis.
Series.idxmin : Return index *label* of the first occurrence
    of minimum of values.

Notes
-----
This method is the Series version of ``ndarray.argmax``. This method
returns the label of the maximum, while ``ndarray.argmax`` returns
the position. To get the position, use ``series.values.argmax()``.

Examples
--------
>>> s = pd.Series(data=[1, None, 4, 3, 4],
...               index=['A', 'B', 'C', 'D', 'E'])
>>> s
```

```
A    1.0
B    NaN
C    4.0
D    3.0
E    4.0
dtype: float64

>>> s.idxmax()
'C'

If `skipna` is False and there is an NA value in the data,
the function returns ``nan``.

>>> s.idxmax(skipna=False)
nan
```

```
data.groupby(['country']).price.agg([len, 'min', 'max'])
```

country	len	min	max
Argentina	3800	4.0	230.0
Armenia	2	14.0	15.0
...	...	...	...
Ukraine	14	6.0	13.0
Uruguay	109	10.0	130.0

Multi-indexes

can help to convert to regular index

```
countries_reviewed = data.groupby(['country', 'province']).description.agg([len])
print(countries_reviewed)
```

```
                            len
country   province
Argentina Mendoza Province  3264
          Other              536
...                          ...
Uruguay   San Jose             3
```

```
          Uruguay              24

[425 rows x 1 columns]
```

```
mi = countries_reviewed.index
type(mi)
```

```
pandas.core.indexes.multi.MultiIndex
```

```
countries_reviewed.reset_index()
```

	country	province	len
0	Argentina	Mendoza Province	3264
1	Argentina	Other	536
...	...	...	...
423	Uruguay	San Jose	3
424	Uruguay	Uruguay	24

```
# create a series of price and points. sort values by price (ascending)
rating = data.groupby('price')['points'].max().sort_index()
print(rating)
```

```
price
4.0       86
5.0       87
          ..
2500.0    96
3300.0    88
Name: points, Length: 390, dtype: int64
```

```
df = data.groupby('variety').price.agg('max', 'min')
print(df)
```

```
variety
Abouriou       75.0
Agiorgitiko    66.0
```

```
              ...
Çalkarası     19.0
Žilavka       15.0
Name: price, Length: 707, dtype: float64
```

Sorting

```
#ascending by defalt
countries_reviewed = countries_reviewed.reset_index()
countries_reviewed.sort_values(by= 'len')
```

	country	province	len
179	Greece	Muscat of Kefallonian	1
192	Greece	Sterea Ellada	1
...	...	...	...
415	US	Washington	8639
392	US	California	36247

```
# descending
countries_reviewed.sort_values(by= 'len', ascending= False)
```

	country	province	len
392	US	California	36247
415	US	Washington	8639
...	...	...	...
63	Chile	Coelemu	1
149	Greece	Beotia	1

```
# sorting index_values
countries_reviewed.sort_index()
```

	country	province	len
0	Argentina	Mendoza Province	3264
1	Argentina	Other	536
...	...	...	...
423	Uruguay	San Jose	3

	country	province	len
424	Uruguay	Uruguay	24

```
# sorting more than one column
countries_reviewed.sort_values(by=['country', 'len'])
```

	country	province	len
1	Argentina	Other	536
0	Argentina	Mendoza Province	3264
...	...	...	...
424	Uruguay	Uruguay	24
419	Uruguay	Canelones	43

Data Types and Missing Data

missing values are given the value NaN - 'Not a Number'- float64 dtype

```
# find the data type
data.price.dtype
```

```
dtype('float64')
```

```
# for every column
print(data.dtypes)
```

```
Unnamed: 0     int64
country       object
               ...
variety       object
winery        object
Length: 14, dtype: object
```

```
# transform data type
data.points.astype('float64')
```

```
0         87.0
1         87.0
          ...
129969    90.0
129970    90.0
Name: points, Length: 129971, dtype: float64
```

```
# finding values in country by NaN
data[pd.isnull(data.country)]
```

	Unnamed: 0	country	description	designation	poin
913	913	NaN	Amber in color, this wine has aromas of peach ...	Asureti Valley	87
3131	3131	NaN	Soft, fruity and juicy, this is a pleasant, si...	Partager	83
...	...	...	...	...	...
129590	129590	NaN	A blend of 60% Syrah, 30% Cabernet Sauvignon a...	Shah	90
129900	129900	NaN	This wine offers a delightful bouquet of black...	NaN	91

```
# replacing missing values
data.country.fillna('Unknown')
```

```
0            Italy
1         Portugal
            ...
129969      France
129970      France
Name: country, Length: 129971, dtype: object
```

```
# replacing ('what?','bywhat?')
data.price.replace('NaN', '@Unknown')
```

```
0          NaN
1         15.0
          ...
129969    32.0
129970    21.0
Name: price, Length: 129971, dtype: float64
```

```
# missing price values and count them
data.price.isnull().sum()
```

```
8996
```

```
# arrange region_1 in ascending order of values
data.region_1.fillna('Unkown').value_counts().sort_values(ascending= False)
```

```
region_1
Unkown          21247
Napa Valley      4480
                ...
Geelong             1
Paestum             1
Name: count, Length: 1230, dtype: int64
```