

# PHILOSOPHY AND HISTORY OF SCIENCE WITH COMPUTATIONAL MEANS

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## Introduction to Pandas

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We start by importing NumPy, which is the fundamental package for scientific computing. Then we import Pandas so that we can create Series and DataFrames (think of them as spreadsheets). So that we do not have to write each time "Series." and "pandas.DataFrame" we also import Series and DataFrame.

```
In [1]: import numpy as np
import pandas as pd

from pandas import Series, DataFrame

In [2]: presocratics = Series(['Thales of Miletus', 'Anaximander', 'Anaximenes', 'Pythagoras', 'Xenophanes',
                             'Heraclitus', 'Parmenides', 'Empedocles', 'Anaxagoras', 'Democritus'])
presocratics

Out[2]: 0    Thales of Miletus
1      Anaximander
2      Anaximenes
3      Pythagoras
4      Xenophanes
5      Heraclitus
6      Parmenides
7      Empedocles
8      Anaxagoras
9      Democritus
dtype: object
```

Note that each value is indexed. We can change the index name (creating another series), and we can select series values.

```
In [3]: arche = Series(['water', 'apeiron', 'air', 'numbers', 'earth', 'logos', 'to be', 'four elements', 'seeds', 'atoms'], index=[presocratics])
arche

Out[3]: Thales of Miletus    water
Anaximander                apeiron
Anaximenes                 air
Pythagoras                 numbers
Xenophanes                 earth
Heraclitus                 logos
Parmenides                 to be
Empedocles                four elements
Anaxagoras                 seeds
Democritus                 atoms
dtype: object

In [4]: arche['Democritus']

Out[4]: Democritus    atoms
dtype: object
```

## To create a DataFrame from scratch

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The number points of each list must match (each column must have the same number of rows).

```
In [48]: presocratics_arche = {'Philosopher':['Thales of Miletus', 'Anaximander', 'Anaximenes', 'Pythagoras', 'Xenophanes', 'Heraclitus',
    'Parmenides', 'Empedocles', 'Anaxagoras', 'Democritus'], 'Arche':['water', 'apeiron', 'air',
    'numbers', 'earth', 'logos', 'to be', 'four elements', 'seeds', 'atoms']}
```

```
In [49]: presocratics_frame = DataFrame(presocratics_arche)
```

```
In [50]: presocratics_frame
```

```
Out[50]:
```

	Philosopher	Arche
0	Thales of Miletus	water
1	Anaximander	apeiron
2	Anaximenes	air
3	Pythagoras	numbers
4	Xenophanes	earth
5	Heraclitus	logos
6	Parmenides	to be
7	Empedocles	four elements
8	Anaxagoras	seeds
9	Democritus	atoms

## To grab a DataFrame from a web page

1. You have to import webbrowser
2. Then create a name (in this case it was "website") equal to and in quotes your link
3. Use the function webbrowser.open(your\_name)
4. Press Shift-Enter and the web page will open

```
In [5]: import webbrowser
website="https://en.wikipedia.org/wiki/The_World%27s_Billionaires"
webbrowser.open(website)
```

```
Out[5]: True
```

5. Copy the frame (a table with rows and columns): highlight them and select Copy

Year	Number of billionaires	Group's combined net worth
2020	2,095	\$8.0 trillion
2019	2,153	\$8.7 trillion
2018	2,208	\$9.1 trillion
2017	2,043	\$7.7 trillion
2016	1,810	\$6.5 trillion
2015 <sup>[7]</sup>	1,826	\$7.1 trillion
2014 <sup>[52]</sup>	1,645	\$6.4 trillion
2013 <sup>[53]</sup>	1,426	\$5.4 trillion
2012	1,226	\$4.6 trillion
2011	1,210	\$4.5 trillion
2010	1,011	\$3.6 trillion
2009	793	\$2.4 trillion
2008	1,125	\$4.4 trillion

6. Choose another name for the DataFrame (in this case it was "net\_worth") equal to `pd.read_clipboard()`
7. Press Shift-Enter to run the cell, write your chosen name and run the cell again.

```
In [6]: net_worth = pd.read_clipboard()
In [7]: net_worth
Out[7]:
```

	Year	Number of billionaires	Group's combined net worth
0	2020	2,095	\$8.0 trillion
1	2019	2,153	\$8.7 trillion
2	2018	2,208	\$9.1 trillion
3	2017	2,043	\$7.7 trillion
4	2016	1,810	\$6.5 trillion

## Other functions

- To see the columns

```
NameOfDataFrame.columns
```

- To create DataFrame with selected columns

```
In [9]: DataFrame(net_worth, columns=['Year', "Group's combined net worth"])
Out[9]:
```

	Year	Group's combined net worth
0	2020	\$8.0 trillion
1	2019	\$8.7 trillion
2	2018	\$9.1 trillion
3	2017	\$7.7 trillion
4	2016	\$6.5 trillion

- To get the first or the last row. If you want the first or last two, change the number 1 to 2 and so on

```
In [11]: net_worth.head(1)
Out[11]:
```

	Year	Number of billionaires	Group's combined net worth
0	2020	2,095	\$8.0 trillion

```
In [12]: net_worth.tail(1)
Out[12]:
```

	Year	Number of billionaires	Group's combined net worth
4	2016	1,810	\$6.5 trillion

- To get a specific row, for example, the first one:

```
NameOfDataFrame.ix[0]
```

- 0 for the first row, 1 for the second, 2 for the third one and so on
- To see all the functions check the documentation:
  - <https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html>

## Important to note

- In Python, indexing starts at 0.

```
Character: s c i e n c e
Index:      0 1 2 3 4 5 6
```

- To show a pop up of the methods on an object press on Tab
- To show help pop up for docstring press Shift-Tab
- To ignore code, put a hashtag at the beginning (in Code cell):

```
# print("This will be ignored because of the hashtag")
```

- To comment, change to a Markdown cell
- We can mix single and double quotes, so that Python does not get confused:

```
"I know that I don't know"
```