Pandas - not just for data scientists

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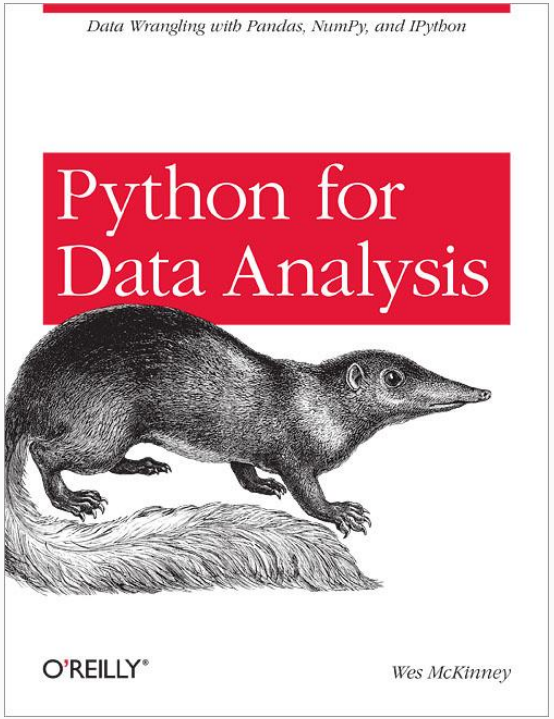
BlueVine

This talk is not...

- for data scientists (but you're welcome to stay :-))
- a tutorial
  - Pandas tutorial by Brandon Rhodes from PyCon 2015: https://www.youtube.com/watch?v=5JnMutdy6Fw
  - Python for Data Analysis by Wes McKinney



This talk...

- is for Python developers
- will expose you to a very powerful tool that can be very useful from research phase to production

pandas

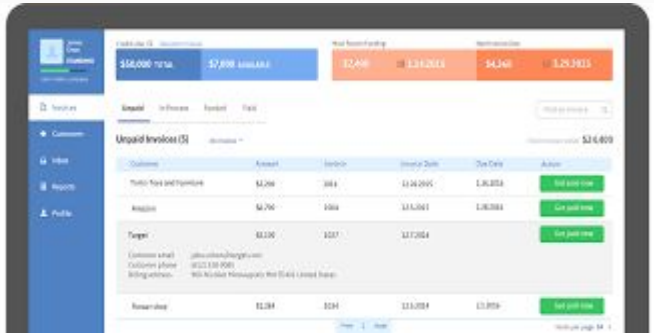
$$y_i t = \beta' x_{it} + \mu_i + \epsilon_{it}$$

About me


Frontend
Linux
C
Django
Software
OSX
NLP
Web
Backend
Python
Obic
PalmOS
Pascal
AVR
Assembler
Blackberry
Project
PostgreSQL
AngularJS
JavaScript
iOS
C++
Development
Linguistics
Swift
Embedded

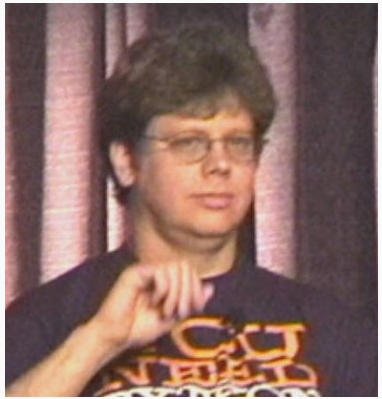
BlueVine

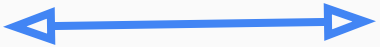
- FinTech - Flexible business lines of credit and invoice factoring
- Reliable and fast risk assessment for potential customers
- Data science:
  - pandas as a major tool
  - Machine learning models
  - Starting to cope with “Big Data” problems



Python - greatness that comes with a price

An interface between the human developer and the machine.





Probably the best general purpose programming language :-)

Not always the best option (greatness comes with a price)

Specialized Python feature

For/list comprehensions

```
list_all = range(100000000)
filtered_list = []
for x in list_all:
    if x > 50000000:
        filtered_list.append(x)
```

```
CPU times: user 13.2 s, sys: 2.1 s
Wall time: 15.6 s
```

```
list_all = range(100000000)
filtered_list = [x for x in list_all if x > 50000000]
```

```
CPU times: user 7.74 s, sys: 3.26 s, total: 11 s
Wall time: 11.6 s
```

This is idiomatic Python and you should always prefer list comprehension when it’s applicable

Leverage the advantages of C (with the greatness of Python)

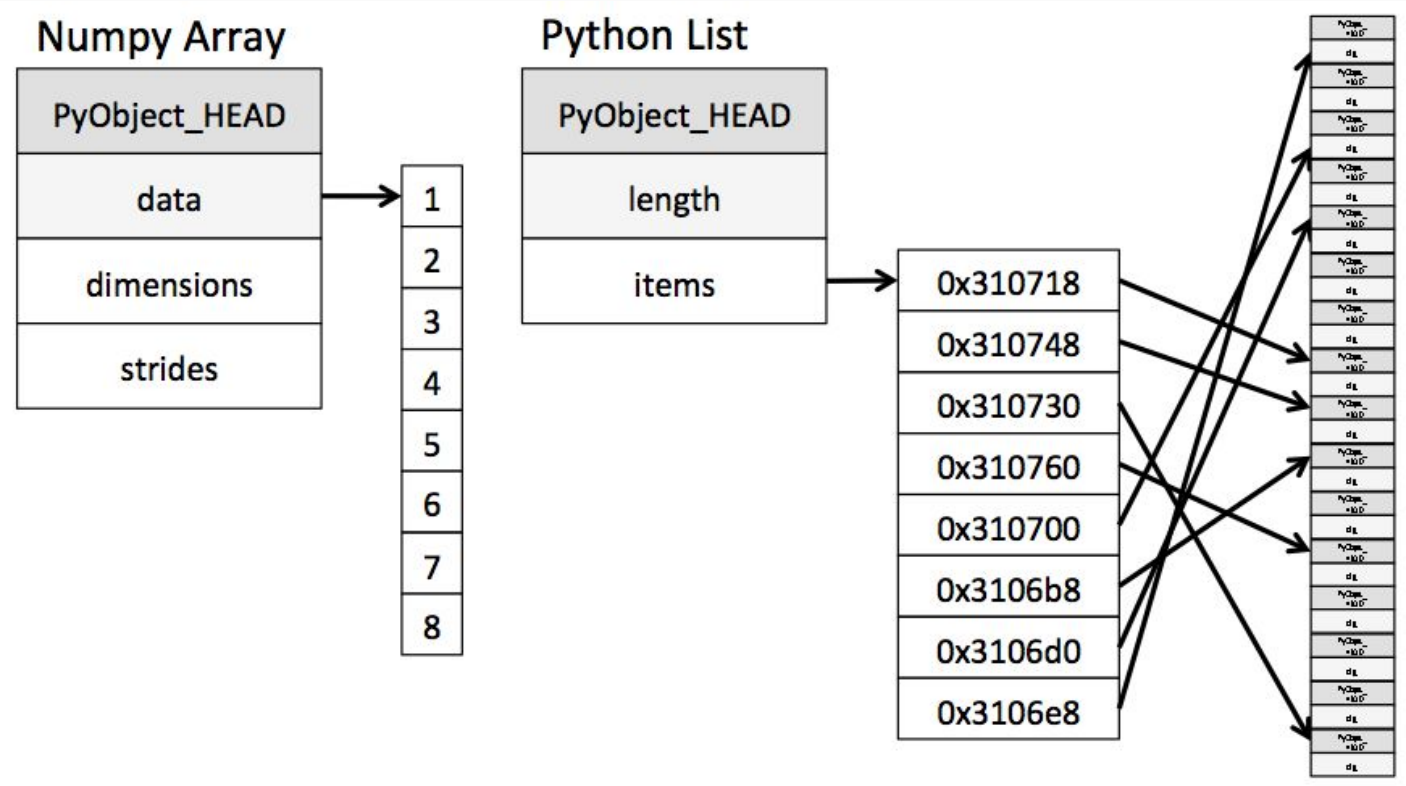
- Implement performance-critical parts of the code in C
- "Python as a glue language"
- Many libraries, including some of the standard libraries in CPython
- Including NumPy & pandas...

NumPy & pandas

- pandas is highly optimized for performance, with critical code paths written in Cython or C

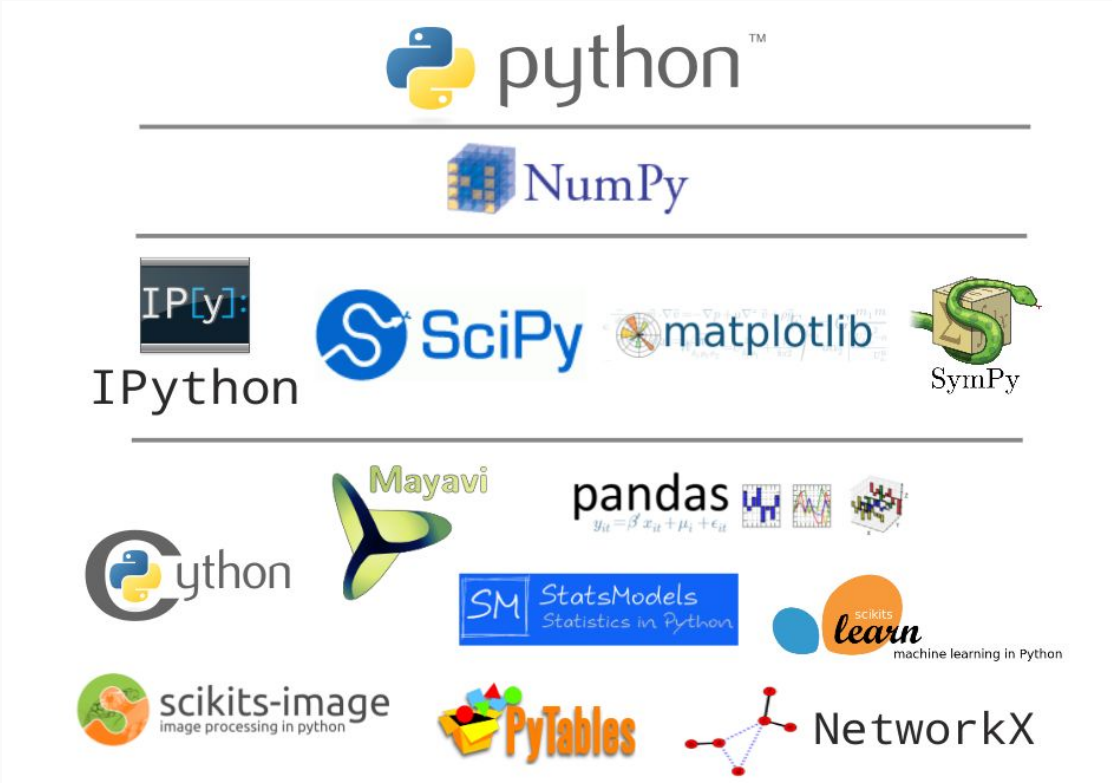
- NumPy array / pandas Series and DataFrame
  - Fixed size at creation
  - Elements are the same data type
  - ufuncs - vectorized version of many useful operations
- Highly flexible and powerful - everything you can do with a DB, Excel or R Data Frames

How can it improve performance



https://jakevdp.github.io/blog/2014/05/09/why-python-is-slow/

Entire Eco System



http://certik.github.io/talk-scipy-india2013/talk/images/python_ecosystem.png


jupyter

How much faster is it?

```
l = list(range(100000000))
a = np.array(l)
```

Without pandas

```
sum(l)
```

```
CPU times: user 1.32 s
```

```
filtered=[x for x in l if x>0.5]
```

```
CPU times: user 13.5 s, sys: 4.57 s
```

```
[x*999 for x in l]
```

```
CPU times: user 8.17 s
```

With pandas

```
a.sum()
```

```
CPU times: user 98.6 ms
```

```
filtered = a[a > 0.5]
```

```
CPU times: user 467 ms
```

```
a*999
```

```
CPU times: user 274 ms
```

Results in production - great performance boost

- Sync process that runs every several minutes
- Comparing hundreds of thousands of values
- External API vs. Django ORM

- X15 faster when moving to pandas
- Cleaner code

Results in production - WOW

- Calculating summaries for aggregated data
- Very complicated business logic

- X1900 faster when moving to pandas
- Much cleaner code
- Optimization for the non-pandas code is doable
  (it will probably won't be as good as with pandas),
  but the price would be MUCH more complicated code

The pandas way

- Work with pandas the way it was designed to be used
- ufunc (e.g. sum()) are better than apply()
- apply() is better than iterating over a Series/DataFrame
- Iterating over a Series/DataFrame is better than iterating over a Python list/dict
- And don’t always follow the most intuitive way...

Twisting your mind

Date	Category
2015-01-02	A
2015-02-02	B
2015-01-12	A
2015-02-22	B
2015-03-08	?
2015-02-22	
2015-01-19	
2015-01-17	

50,000 rows

13 categories

From Date	To Date	Category to Assign
2015-01-02	2015-01-21	A
2015-01-22	2015-02-27	B
2015-02-28	2015-03-15	C
2015-03-15	2015-04-01	D

Twisting your mind

- Straight forward approach:
  df[“category”] = df.apply(get_period)

- The efficient approach:

```
for from_date, to_date, category in periods:
        df.loc[(df['date'] >= from_date) &
                (df['date'] < to_date), ‘category’] = category
```

- X2340 faster (26.1ms vs. 61 seconds)!!!

Data Exploration with Jupyter & pandas

- Very powerful tools to explore the data
- Run the same notebook in multiple environments (production, staging)
- Run the same notebook in different times
- Share notebook with other team members
- Or share only the results (HTML, PDF)
- Use the notebook as starting point for your production code

Summary

Learn pandas (and start using Jupyter)!

- Explore your data more effectively
- Optimize your code (and make it cleaner):
  - Data analysis
  - Sync processes
  - Reports / Exports
- And when you use pandas - remember that changing your point of view can lead you to more efficient implementation

Thank you!

(oh yeah, and we’re hiring ;-))

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Extras

Specialized Python feature

Slots (you shouldn't use this in your code)

```
class Test:
    def __init__(self, a, b, c):
        self.a = a
        self.b = b
        self.c = c

for i in range(10000000):
    Test(i,i,i)
```

```
CPU times: user 6.57 s, sys: 40.1 ms
Wall time: 6.68 s
```

```
class Test:
    __slots__ = ['a', 'b', 'c']

    def __init__(self, a, b, c):
        self.a = a
        self.b = b
        self.c = c

for i in range(10000000):
    Test(i,i,i)
```

```
CPU times: user 5.41 s, sys: 33.8 ms
Wall time: 5.49 s
```