Performance Pandas

PyDataLondon 2015

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https://github.com/jreback/pydata2015-london

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@jreback

- former quant
- currently working on projects at Continuum
- core commiter to pandas for last 3 years
- manage pandas since 2013

What do we care about when writing code?

Objectives

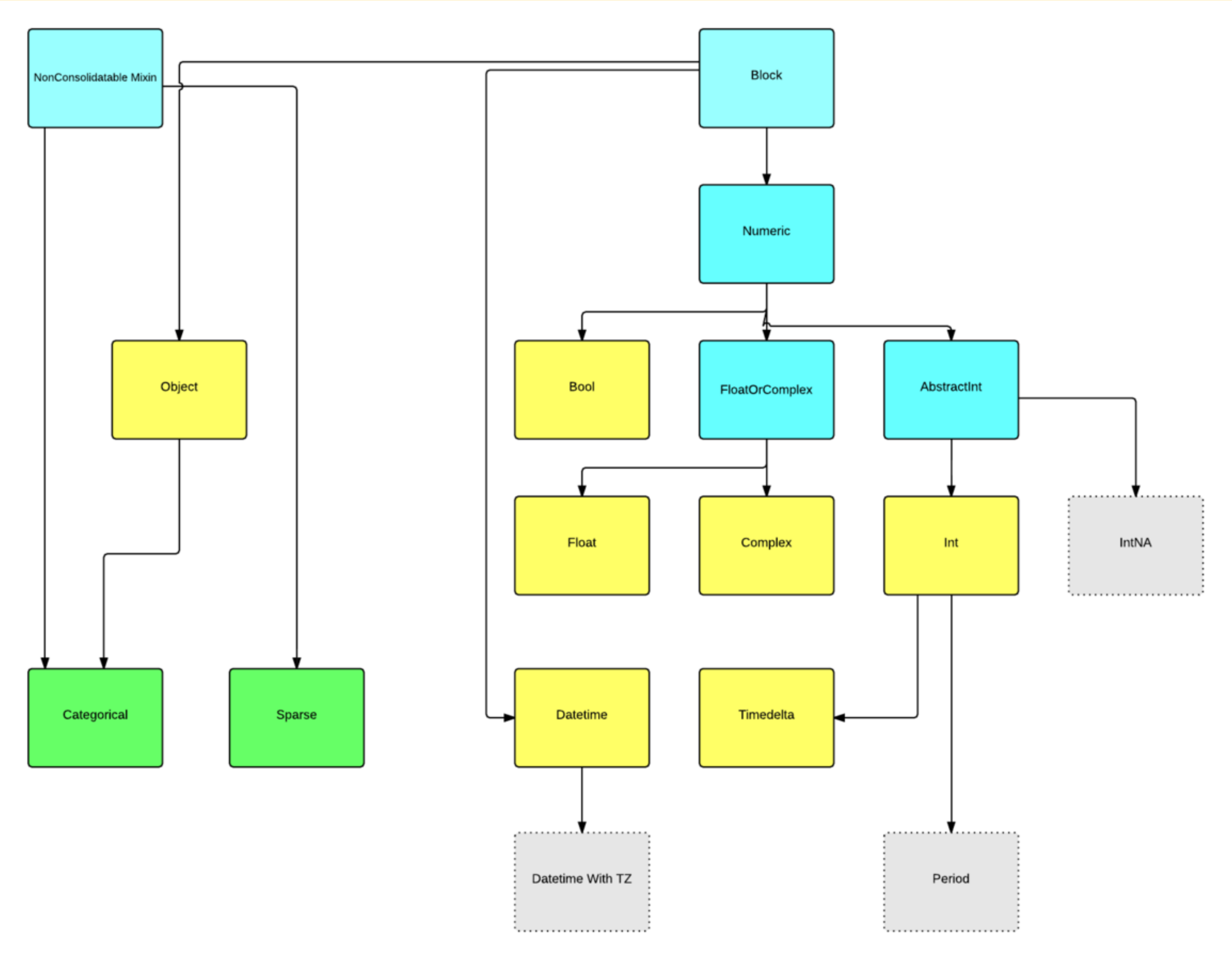
- feature set
- readability counts
- maintenance is a virtue
- tests & docs

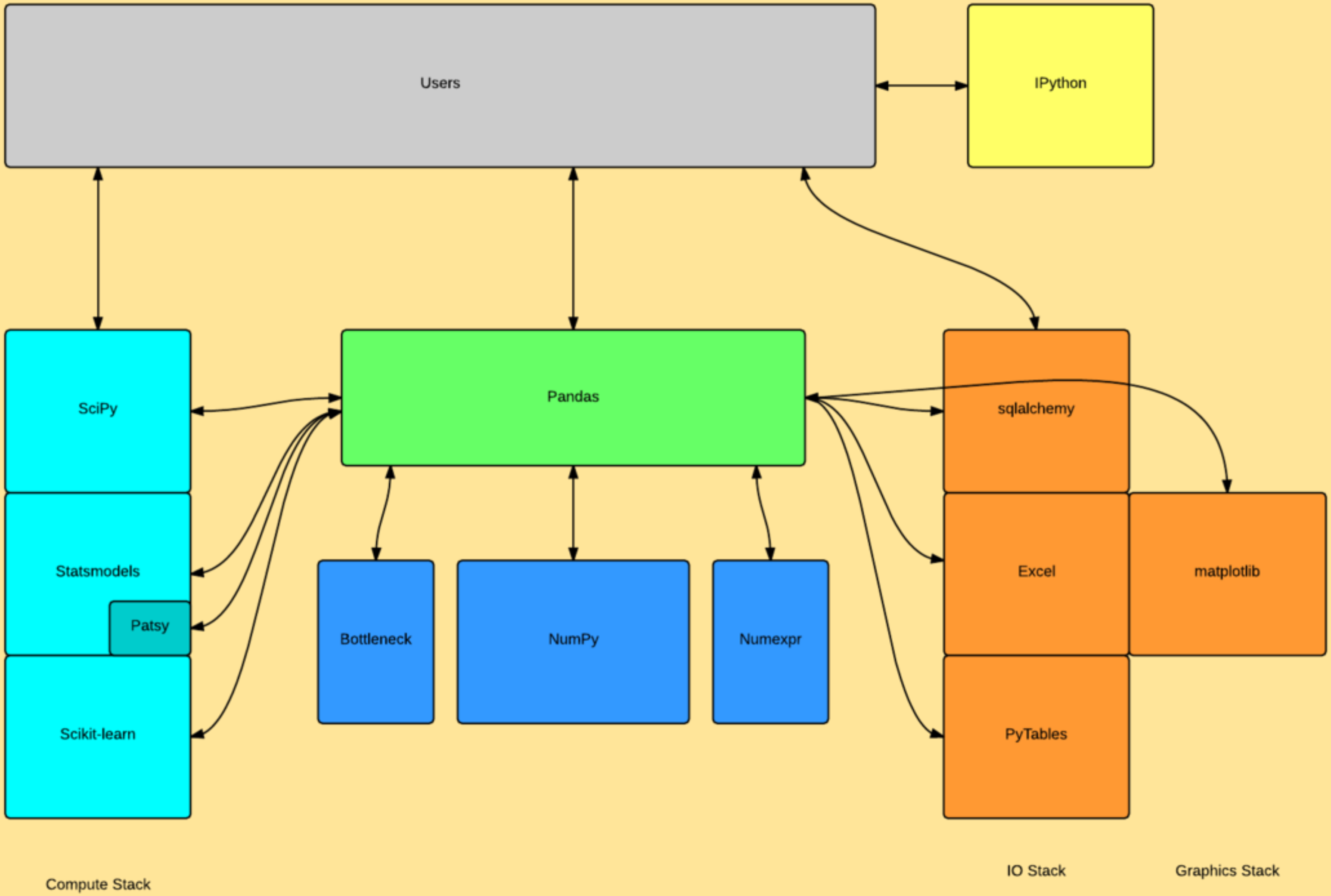
Constraints

- implementation time
- runtime
- resource utilization

What drives pandas?

- dtype segregation
- column blocks memory layout
- computation backends
- cython for critical parts
- hashtable for indexing


NonConsolidatable Mixin
Block
Numeric
Object
Bool
FloatOrComplex
AbstractInt
Float
Complex
Int
IntNA
Categorical
Sparse
Datetime
Timedelta
Datetime With TZ
Period


Users
IPython
SciPy
Pandas
sqlalchemy
Statsmodels
Patsy
Bottleneck
NumPy
Numexpr
Excel
matplotlib
Scikit-learn
PyTables
Compute Stack
IO Stack
Graphics Stack

how to make pandas perform

1. Have Correct Code
2. Profile / Compare
3. Refer to Rules #1 and #2

I DON'T ALWAYS COMPARE THINGS
BUT WHEN I DO, IT'S APPLES TO ORANGES
quickmeme.com

“ Programmers waste enormous amounts of time thinking about, or worrying about, the speed of noncritical parts of their programs, and these attempts at efficiency actually have a strong negative impact when debugging and maintenance are considered.

“ premature optimization is the root of all evil (or at least most of it) in programming.

The Art of Computer Programming, Donald Knuth (1974)

How to make pandas fast

- algo
- idioms
- built-in / vectorization
  - pandas/numpy
  - bottleneck/numexpr
  - cython
- ad-hoc cython/numba

How to make pandas ~~fast~~ slow

- apply
- itertuples/iterrows
- iterative updating

.values

A double edged sword

Do's

- have the correct dtypes
- *Categoricals*
- Use idioms & builtin

Don'ts

- micro optimize
- use loops / re-invent the wheel
- .apply()
- nest *groupby.apply()*
- *.values*
- *inplace=True*

Memory Considerations

- conversions
- categoricals
- iterators

I/O & Serialization

- HDF5
- CSV
- SQL
- JSON
- pickle
- msgpack

http://matthewrocklin.com/blog/work/2015/03/16/Fast-Serialization/

http://odo.readthedocs.org/en/latest/

I need even more!

- out-of-core
- GIL
- dask
  - threading
  - multi-process
  - distributed

https://dask.readthedocs.org/en/latest/

How to contribute

https://github.com/pydata/pandas/issues

This Talk

https://github.com/jreback/pydata2015-london