
Open Source Software at



Quantopian

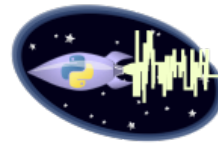
by Dr. Thomas Wiecki

About me

- Data Science Lead at Quantopian
- PhD from Brown University studying computational neuroscience
- Contributor to PyMC



Quantopian



BROWN



Quantopian Community



- Fundamentals in re
- In need of a Quant Help
- In need of a Quant Help
- Scoring Changes fo
- Should prices reall
- Feature Request: A

Fundamentals Demo Algo

Save Build Algorithm Enter Contest Collaborate API Reference

```

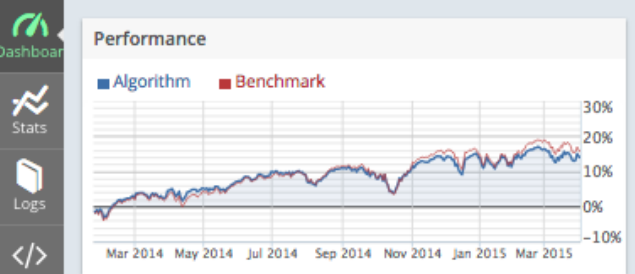
1 def initialize(context):
2     pass
3
4 def before_trading_start(context):
5     fundamental_df = get_fundamentals(context)
6     fundamentals_val = fundamentals_val(context)
7     fundamentals_cash = fundamentals_cash(context)
8     fundamentals_oper = fundamentals_oper(context)
9     fundamentals_inco = fundamentals_inco(context)
10    fundamentals_bal = fundamentals_bal(context)
11    fundamentals_valu = fundamentals_valu(context)
12    fundamentals_comp = fundamentals_comp(context)
13    fundamentals_shar = fundamentals_shar(context)
14
15    context.fundamental_df = fundamental_df
16
17    context.fundamentals_val = fundamentals_val
18    context.fundamentals_cash = fundamentals_cash
19    context.fundamentals_oper = fundamentals_oper
20    context.fundamentals_inco = fundamentals_inco
21    context.fundamentals_bal = fundamentals_bal
22    context.fundamentals_valu = fundamentals_valu
23    context.fundamentals_comp = fundamentals_comp
24    context.fundamentals_shar = fundamentals_shar
25
26    context.update_universe(fundamentals_val)
27
28    def rebalance(data, weight):
29        for stock in data:
30            order_target_percent(context, stock, weight)
31            log.info("Purchased %s" % stock)
32
33    else:
34        log.warn("Couldn't order %s" % stock)
35
36    def handle_data(context, data):
37        position_weight = 1/30
38        rebalance(context, position_weight)
39
40    # buy the cheapest by PE ratio
41    rebalance(context, position_weight)
42

```

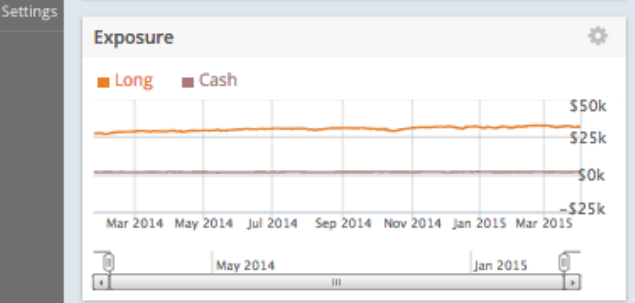
Backtesting 7.1% Cancel

for reals. daily rebal 9 sector ETFs BETA MARKET CLOSED Stop Algorithm

14.30% Returns \$4,185.97 Dollar P/L 0.72 Sharpe \$31,876.50 Long Exposure \$0.00 Short Exposure \$1,651.91 Available Cash



No custom signals



Positions (9)

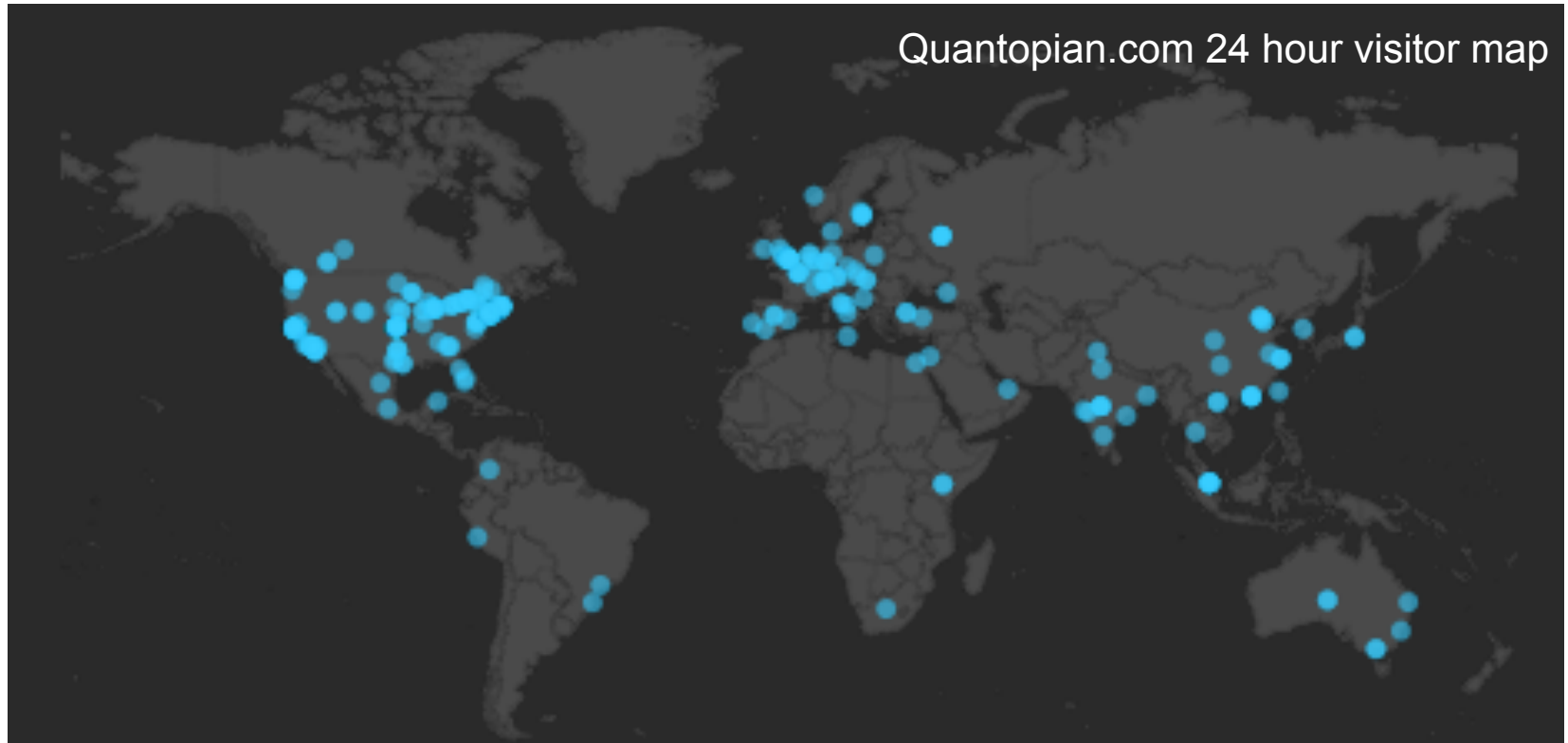
Security	Shares	Price	Avg Cost	Value	Unrealiz...
XLP	73	\$49.12	\$42.34	\$3,585.76	\$494.72
XLE	46	\$77.70	\$84.51	\$3,574.20	(\$313.26)
XLU	80	\$44.57	\$40.77	\$3,565.60	\$303.60
XLY	47	\$75.68	\$64.40	\$3,556.96	\$530.35
XLF	146	\$24.20	\$21.91	\$3,533.93	\$334.78
XLV	49	\$71.98	\$57.66	\$3,527.02	\$701.78
XLB	72	\$48.96	\$45.43	\$3,525.12	\$254.45

Orders and Fills

Date	Security	Type	Shar...	Limit	Stop	Status
2015-04-01 ...	XLV	Market	1			Filled
2015-04-01 ...	XLK	Market	1			Filled
2015-03-31 ...	XLK	Market	1			Cancell...
2015-03-31 ...	XLF	Market	1			Cancell...
2015-03-30 ...	XLU	Market	1			Filled
2015-03-26 ...	XLE	Market	-1			Filled
2015-03-26 ...	XLF	Market	-1			Filled
2015-03-20 ...	XLV	Market	-1			Filled
2015-03-19 ...	XLU	Market	-1			Filled
2015-03-19 ...	XLF	Market	1			Filled

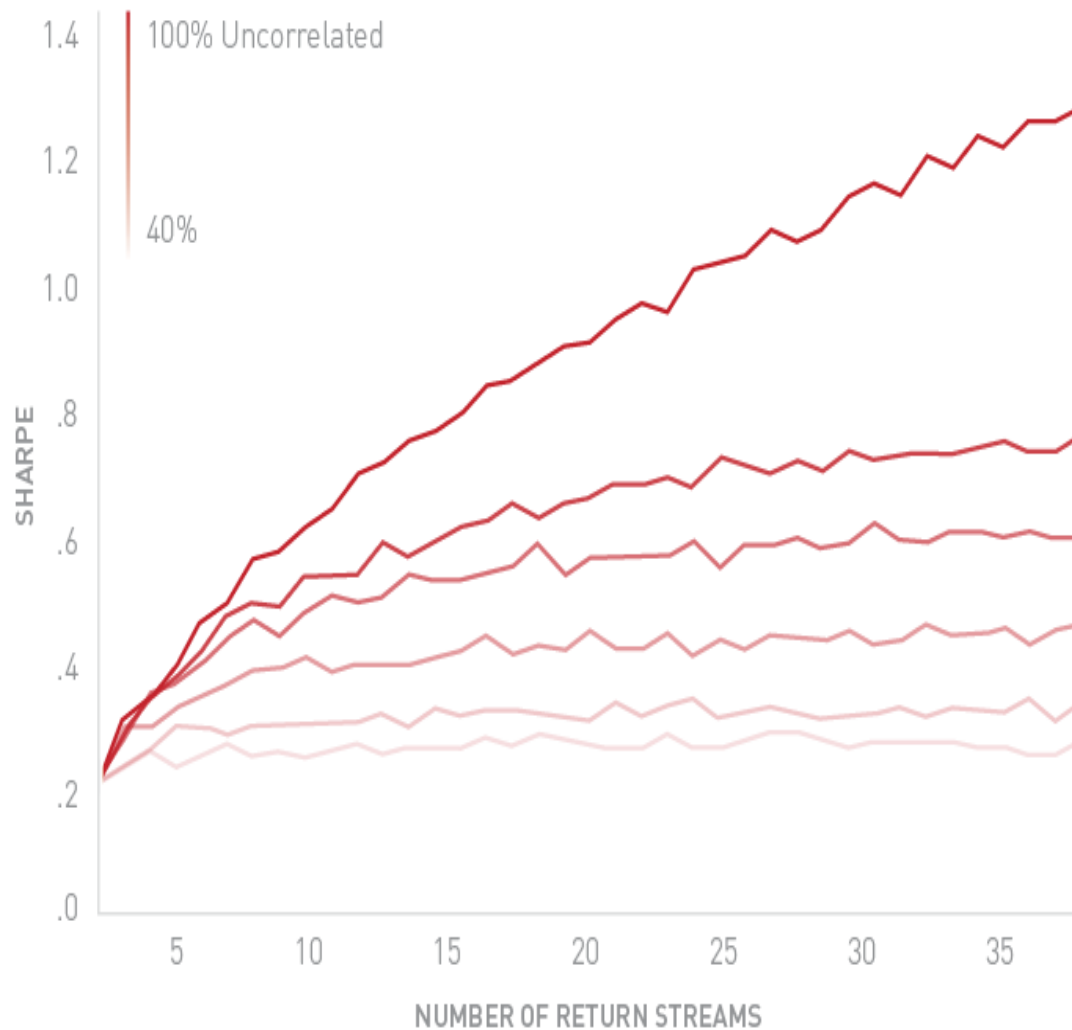
Crowdsourcing – the process of obtaining needed services, ideas or content by soliciting contributions from a large group of people, and especially an online community, rather than from traditional employees or suppliers.

<http://en.wikipedia.org/wiki/Crowdsourcing>



50-75,000 visits per month | 25-45,000 unique visitors per month
37,000 registered users | 400,000 algorithms

“Uncorrelated return streams are the Holy Grail of Investing.” – Ray Dalio



The Quantopian Open

launched January 2015

RANK	NAME	SCORE
1	Phillip Strong	96.23
2	Mary Swan	94.67
3	George Guy	90.03
4	Nina Girl	78.34
5	Elon Smith	66.09

Announcing the Quantopian Open

Compete to manage \$100,000 of our money. Win and you keep 100% of the profits.

February 2, 2015 submission deadline. First winner selected on February 28th.

Get Started

OSS at Quantopian: Tools we use

- Linux
 - Docker
 - Python (NumPy, SciPy, Pandas, IPython, Matplotlib)
 - MongoDB, PostgreSQL
 - ...
-

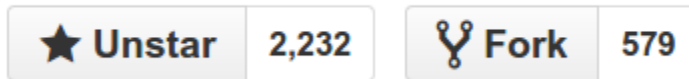
Not that special

A recent survey showed that 78% of companies run on open source.

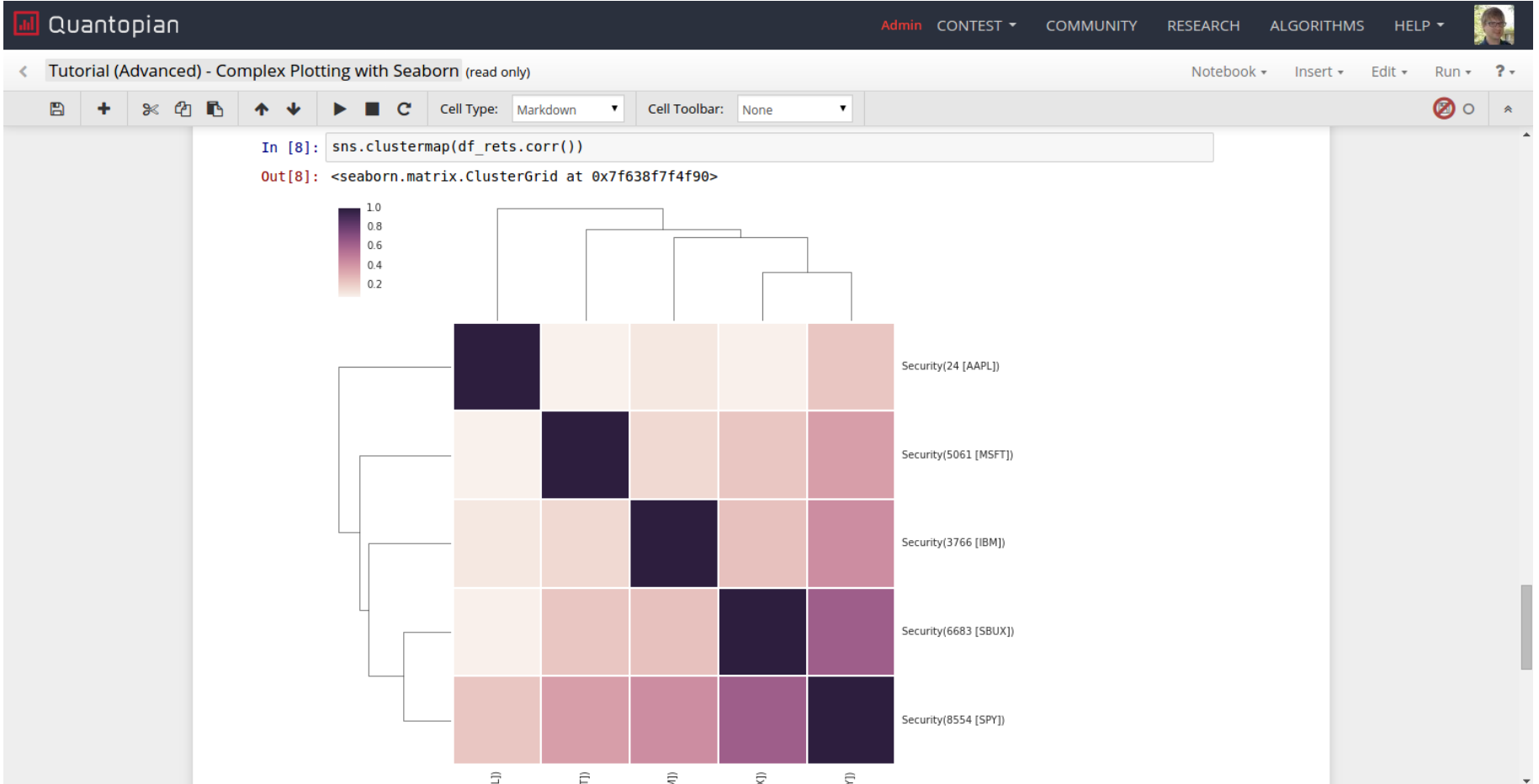
**Software that we
open sourced**

Zipline

- Backtester written in Python
- Used in production on Quantopian.com
- Permissive Apache v2 licensed
- <http://www.zipline.io/>
- Some stats:
 - 87% test covered
 - PyPI: 1852 downloads in the last month



Quantopian Research Platform



Quantopian Research Platform

- Hosted IPython notebook with access to all of Quantopian's data
 - Several contributions:
 - Fixes and features to IPython
 - pgcontents: A Postgres-backed storage for IPython notebooks
 - DockOrm: An object-relational mapper for docker containers.
 - qgrid
-

qgrid

Qgrid is an IPython extension which uses SlickGrid to render pandas DataFrames within an IPython notebook. It's being developed for use in [Quantopian's hosted research environment](#), and this repository holds the latest source code.

```
In [5]: qgrid.show_grid(spy, remote_js=True)
```

Date ▲	Open	High	Low	Close	Volume	Adj_Ratio
2011-01-03	117.375048	118.199481	116.439457	117.69	138725200	0.926328
2011-01-04	117.944201	117.981252	116.888233	117.62	137409700	0.926288
2011-01-05	117.258063	118.314108	117.146901	118.24	133975300	0.926355
2011-01-06	118.277887	118.407567	117.64801	118	122519000	0.926289
2011-01-07	118.159047	118.35357	116.852961	117.77	156034600	0.926302
2011-01-10	117.249485	117.786732	116.897496	117.62	122401700	0.926288
2011-01-11	118.049263	118.327157	117.59537	118.04	110287000	0.926312
2011-01-12	118.767251	119.239689	118.072489	119.11	107929200	0.926349
2011-01-13	119.15084	119.206418	118.613582	118.91	129048400	0.926307
2011-01-14	118.741812	119.797789	118.658445	119.77	117677900	0.926295
2011-01-18	119.665043	120.091161	119.526092	119.98	114401300	0.926343
2011-01-19	119.874526	119.994947	118.485053	118.8	151958400	0.926316
2011-01-20	118.528844	118.936415	117.760019	118.64	175745700	0.926296
2011-01-21	119.382416	119.651045	118.780317	118.91	151462900	0.926307

Many more...

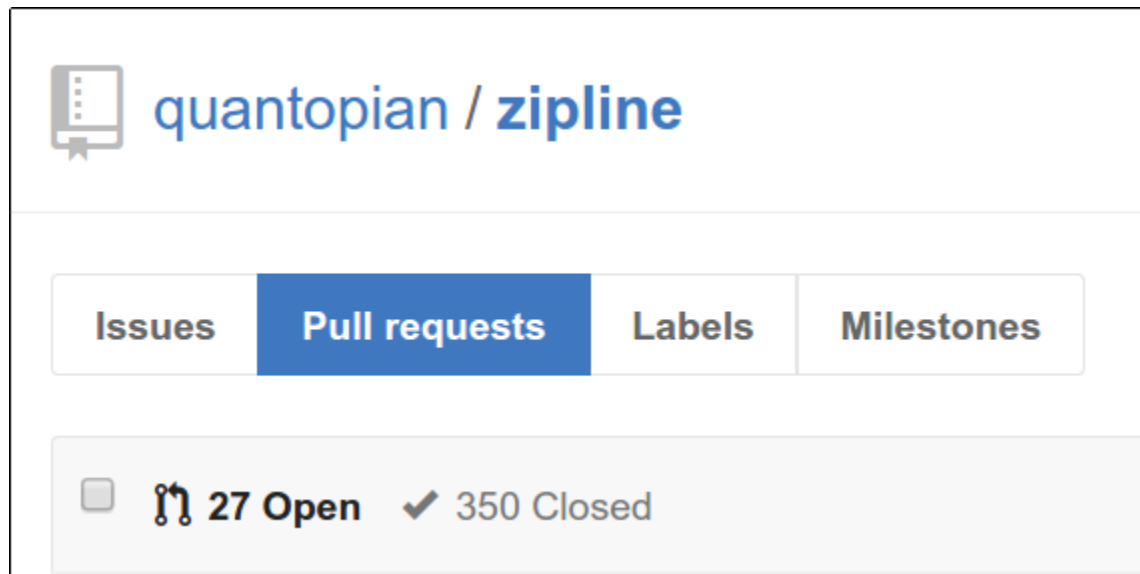
- qdb: Python debugger
 - metaultils: metaprogramming in Python
 - CoalMine: DevOps
 - Contributions to:
 - Pandas
 - scikit-learn
 - PyMC3
 - ...
 - “If it’s useful to a wider audience, let’s open source it!” -- Fawce (CEO)
-

“Why Open Source your IP? Are you crazy?”

- Contribute back to the community.
-

Have community contribute back to us!

“Given enough eyes all bugs are shallow” - Linus Torvalds

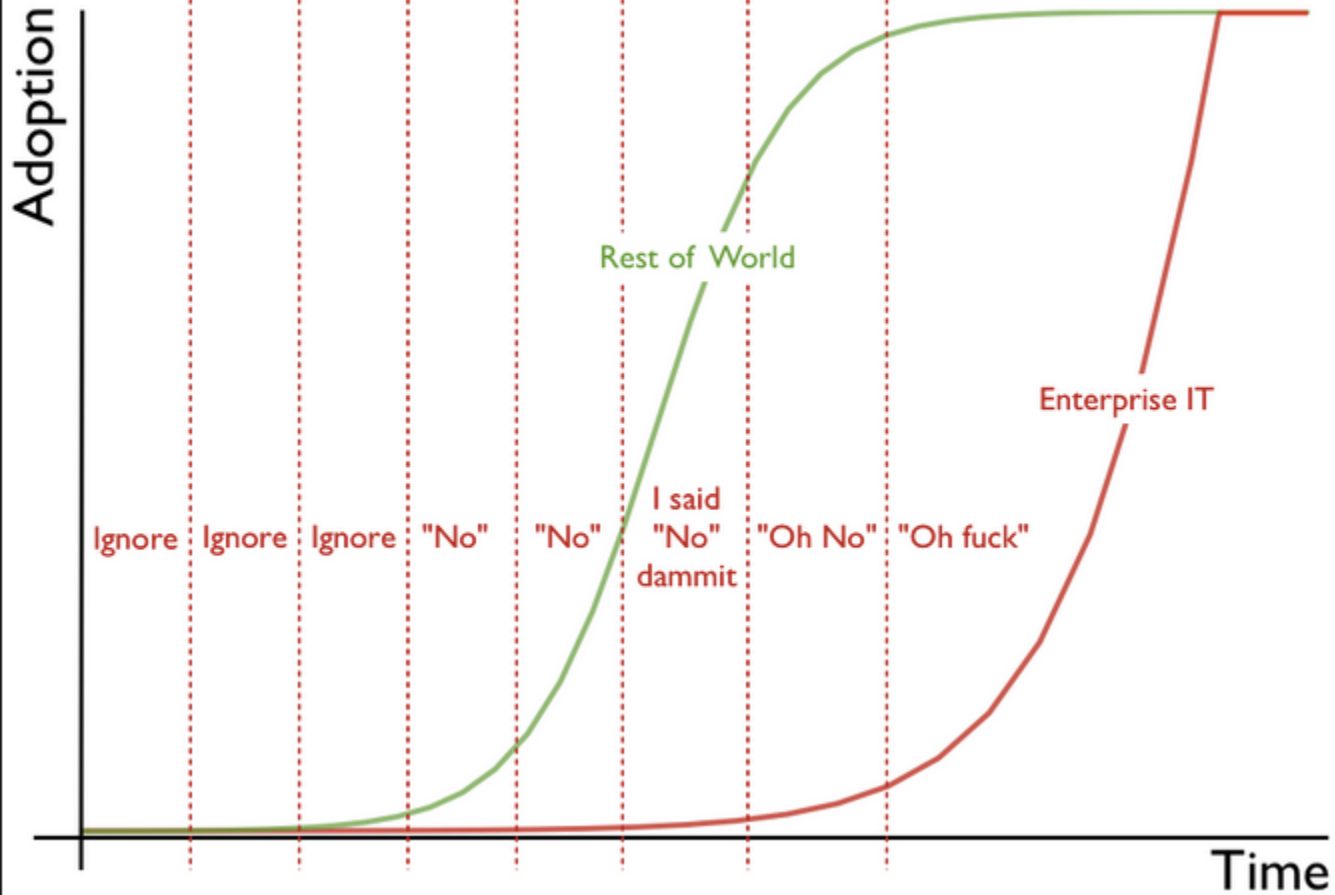


The screenshot shows the GitHub interface for the repository `quantopian / zipline`. The repository name is displayed in blue text next to a document icon. Below the repository name, there are four tabs: `Issues`, `Pull requests` (which is highlighted in blue), `Labels`, and `Milestones`. At the bottom of the screenshot, there is a summary bar showing a pull request icon, the text `27 Open`, and a checkmark icon followed by `350 Closed`.

“Why Open Source your IP? Are you crazy?”

- Helps build trust in product - not a black box
 - Good will from community.
 - Hiring
 - OSS enthusiasts are often amazing developers.
 - Pull request is the best job application.
 - Developers have something to show.
 - Very little downside risk!
 - “Why not?”
-

Enterprise IT Adoption Cycle

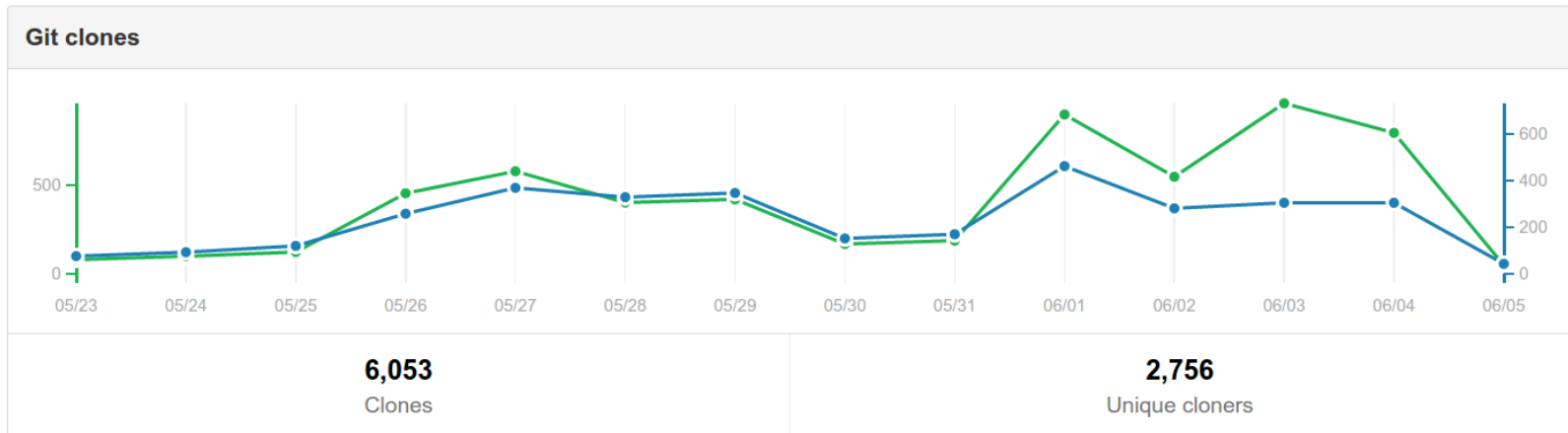


Success Stories

Zipline <> Quantopian


- We want the world's best backtester.
 - Zipline to Quantopian:
 - another funnel to the Quantopian platform
 - Quantopian to Zipline:
 - Quantopian not a good fit for everyone
 - Users do not get lost
-

AlephNull






- Zipline fork
 - Refactor core implementations
 - Ended up not merging back but reimplementing in different ways
 - Free experimentation!
-


User PRs

 [quantopian](#) / [zipline](#) Unwatch ▾ 307

WIP: General perf enhancements #458

Closed [dalejung](#) wants to merge 20 commits into `quantopian:master` from `dalejung:loop_perf`

 Conversation 24  Commits 20  Files changed 4

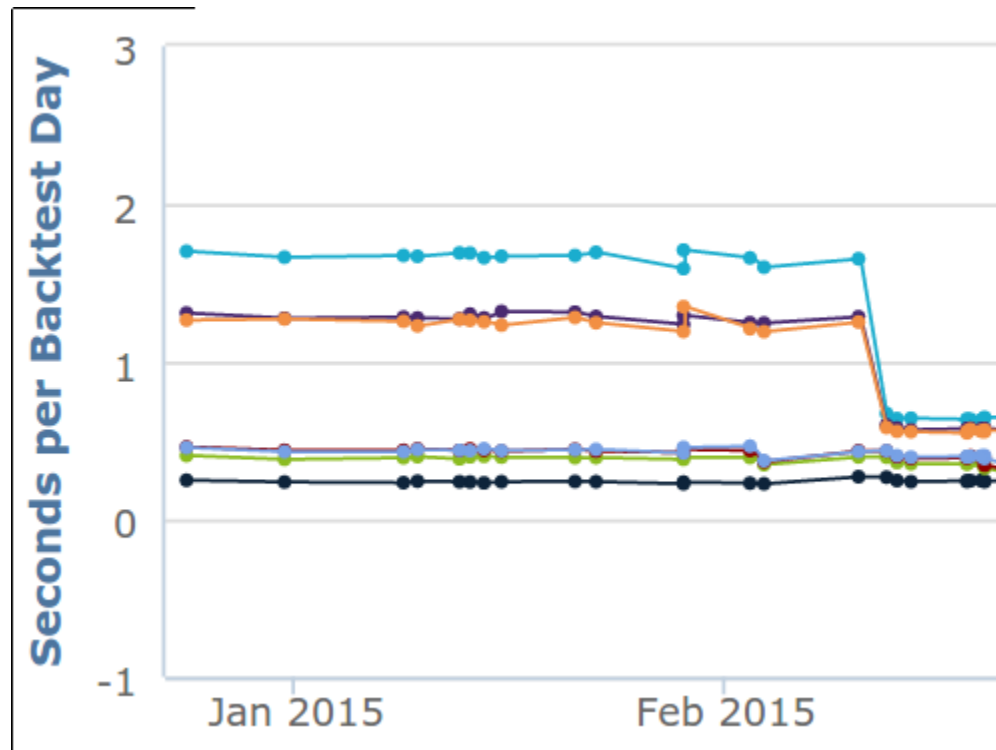


[dalejung](#) commented on Dec 27, 2014

This is mainly targeted at minutely backtests with daily emissions. Having a 1-to-1 emission causes the perf tracking to dominate performance, which I haven't touched.

Can someone else run this and let me know the timings? Especially with an algo that's public and that I can also run.

3x speed-up





GrundGrün

- Berlin-based start-up in energy futures trading
 - Uses zipline as a backtester for their algorithms
 - Need features we also wanted (futures support)
 - more developer power
 - many examples of where they provided critical features or pointed out subtle bugs
-

OSS licenses

GPL, BSD, MIT, Apache...

oh my!

- Always license your code!
 - Copyleft (GPL)
 - “viral”: every derivative work must remain GPL.
 - Permissive (BSD, MIT)
 - Do whatever you want with the code
 - Except claim you wrote it
 - Apache v2
 - Like BSD and MIT but protections against patents
-

A case for permissive licenses

- Why not use it?
 - Fear: Company “steals” code, repackages, and re-sells it.
 - Most important predictors of success:
 - number of users
 - number of contributors
 - Companies hate GPL. No adoption, no contributions.
 - Example: GrundGrün, Universities
-

Lessons learned

- Use GitHub.
 - Can be strategic about what you open source.
 - Not free:
 - Helping users on mailing lists
 - Reviewing pull requests
 - Making proper releases
 - Writing documentation
 - Odd interdependency to our private code
 - People lose interest quickly if responses are sluggish.
 - Enforce high coding standards for everyone
 - Unittests
 - Coding guidelines (PEP8)
 - Rigorous code review
-