CI / CD Pipeline Tools and Their Signals

Bogdan Vasilescu
Microsoft Faculty Summit 2018

joint work with Trockman, Zhou, Kästner. ICSE 2018

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SOCIO-TECHNICAL RESEARCH USING DATA EXCAVATION LAB

UNIVERSITY OF EVANSVILLE
EST 1854
Civic Mission…Sacred Trust

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isr institute for SOFTWARE RESEARCH

Tools being used in npm

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Tools being used in npm

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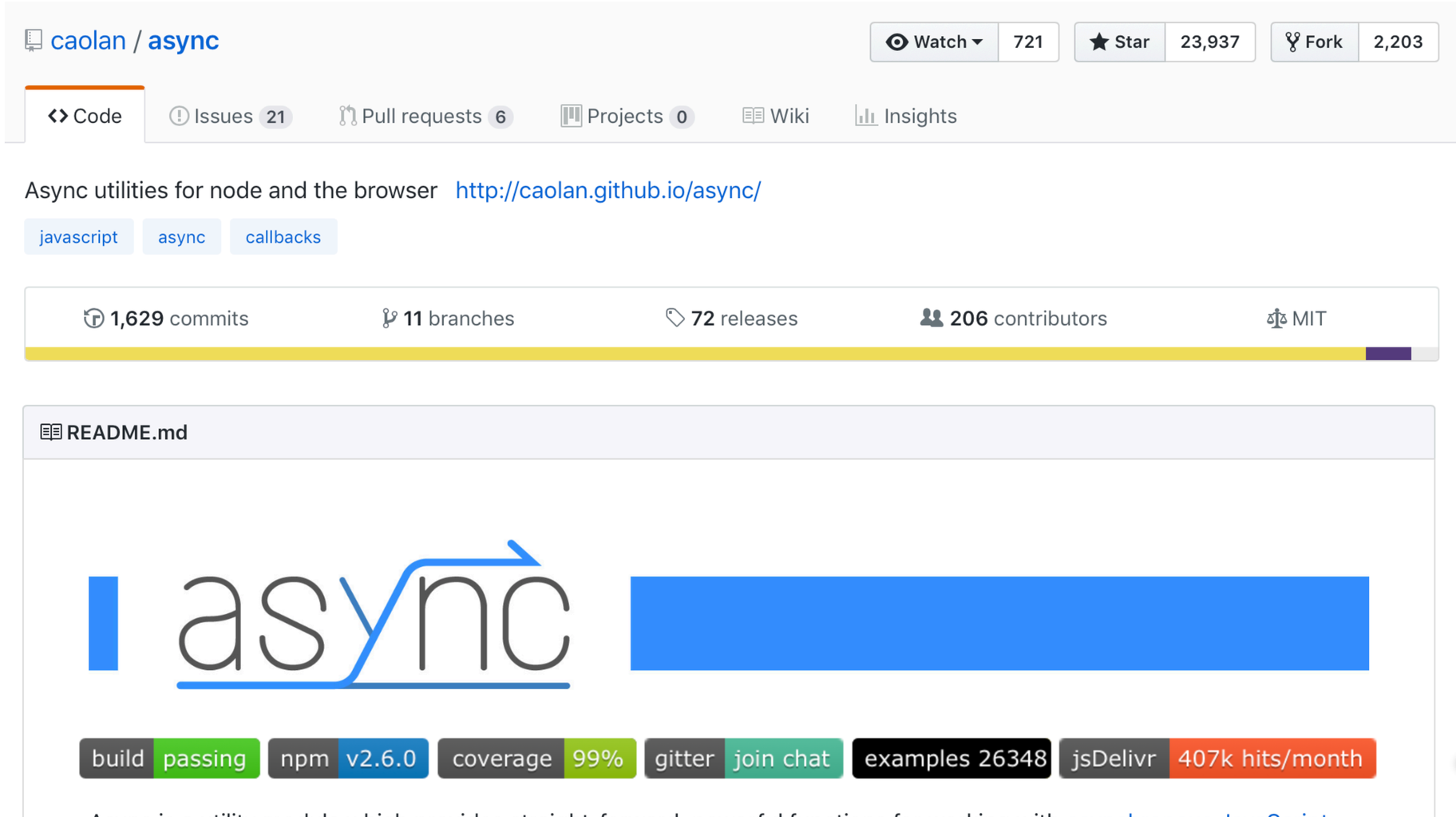
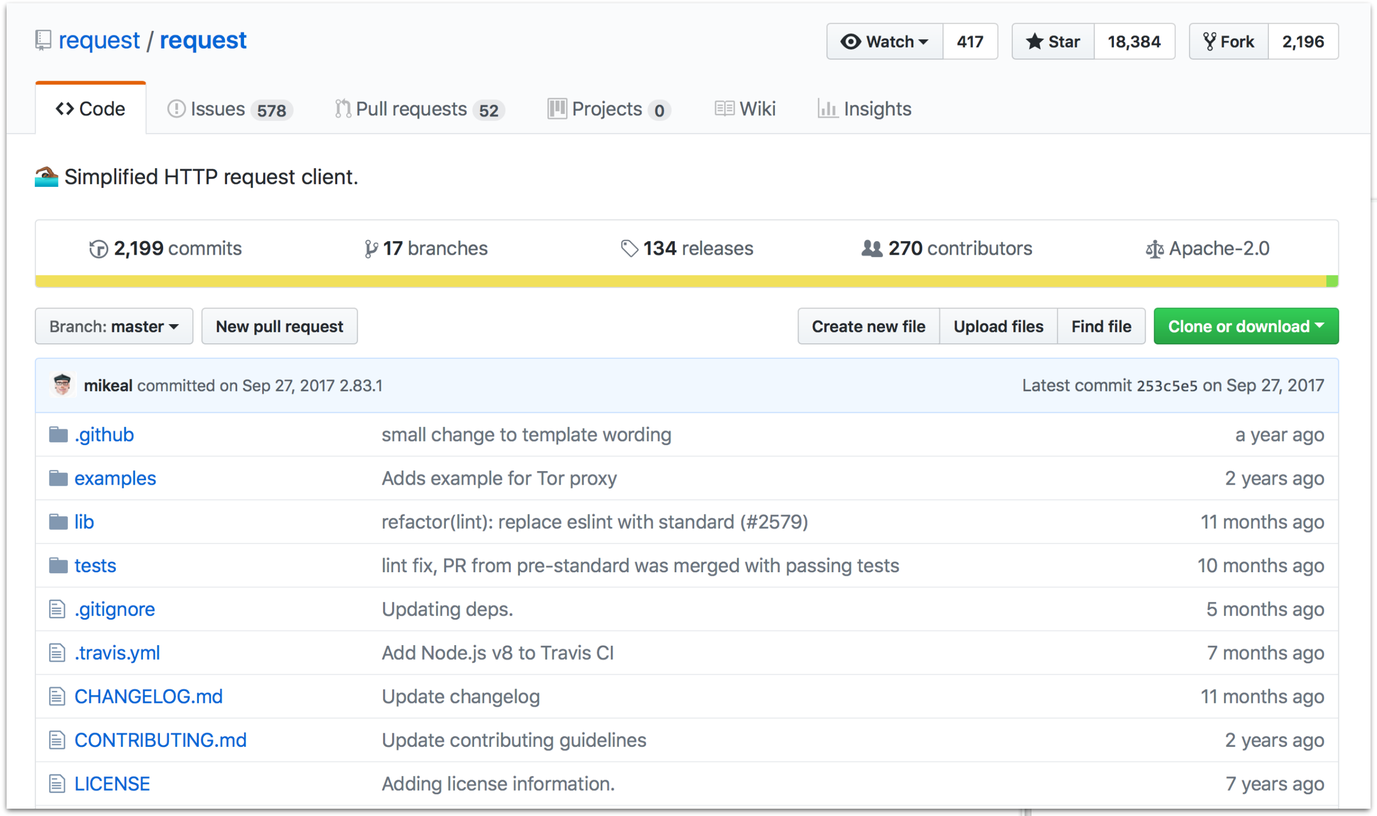
GitHub Repository Badges



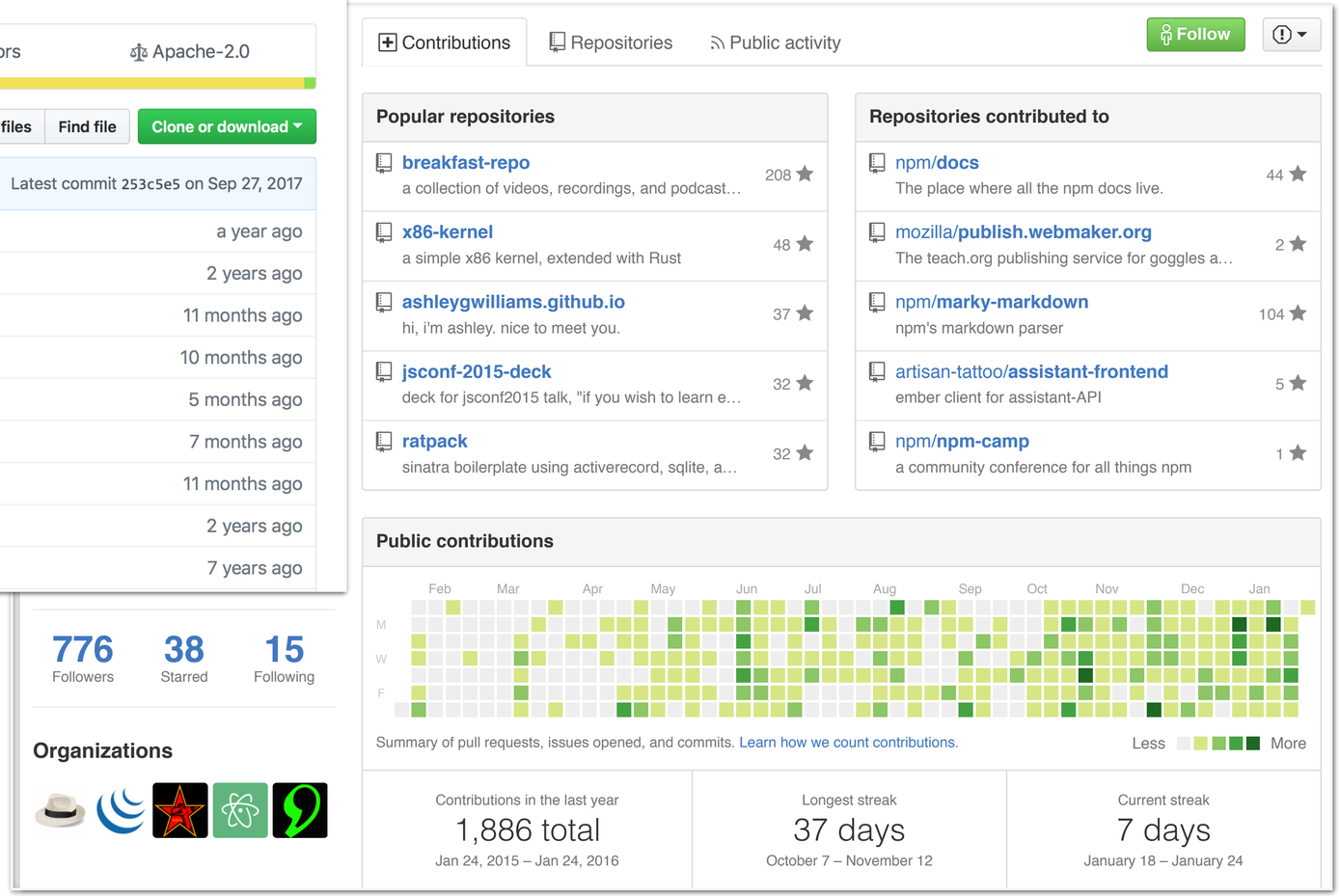
Enlarged to show detail.

Social coding: Transparency & signaling



Projects

Users



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Signals can also be physical

MONITORING YOUR CONTINUOUS INTEGRATION SERVER WITH TRAFFIC LIGHTS AND AN ARDUINO

Note: If you like this post, you'll probably also like the update on our Jenk

So how does one connect a 48" tall traffic light to a continuous integration s
course.

Continuous Integration of Shame

A conversation on Twitter recently popped up on the use of physical objects to denote build status. You know what I mean: "You broke the build, so you get the rubber chicken! And have to display it on your desk until *someone else* breaks the build!"

Build status: plucky. Photo credit: James Shore.

"Peer monitoring"

Phillips, Zimmermann, Bird. Understanding and improving software build teams. ICSE 2014

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What do developers expect from badges?

- *32* Maintainers
  - What do you intend to signal?
  - What effects do you expect?
- *57* Contributors
  - What do badges tell you?

"welcoming contributions"

"expectations of contribution quality"

"dedicated to offering support"

"reduced chances of conflicting versions of dependencies"

"indicator of product quality"

Analysis

Correlation

If all you saw was the badge, how much would that tell you?

Regression Analysis

How much more does the badge tell you, relative to existing signals?

Time Series Analysis

How do things change after adding the badge?

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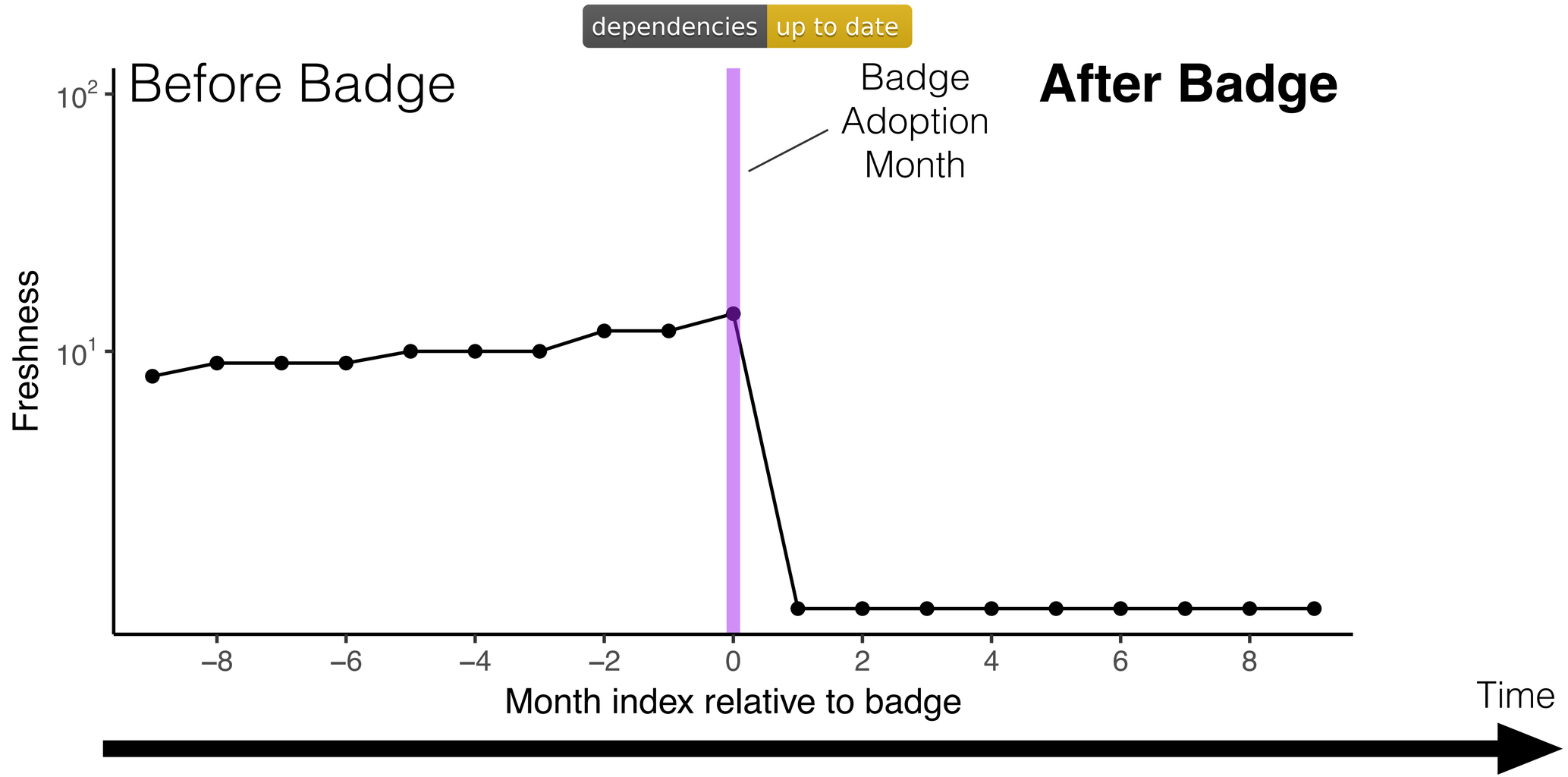
Time Series Analysis

How do things change after adding the badge?

Step 3: Time Series Analysis

Signals of fresh dependencies



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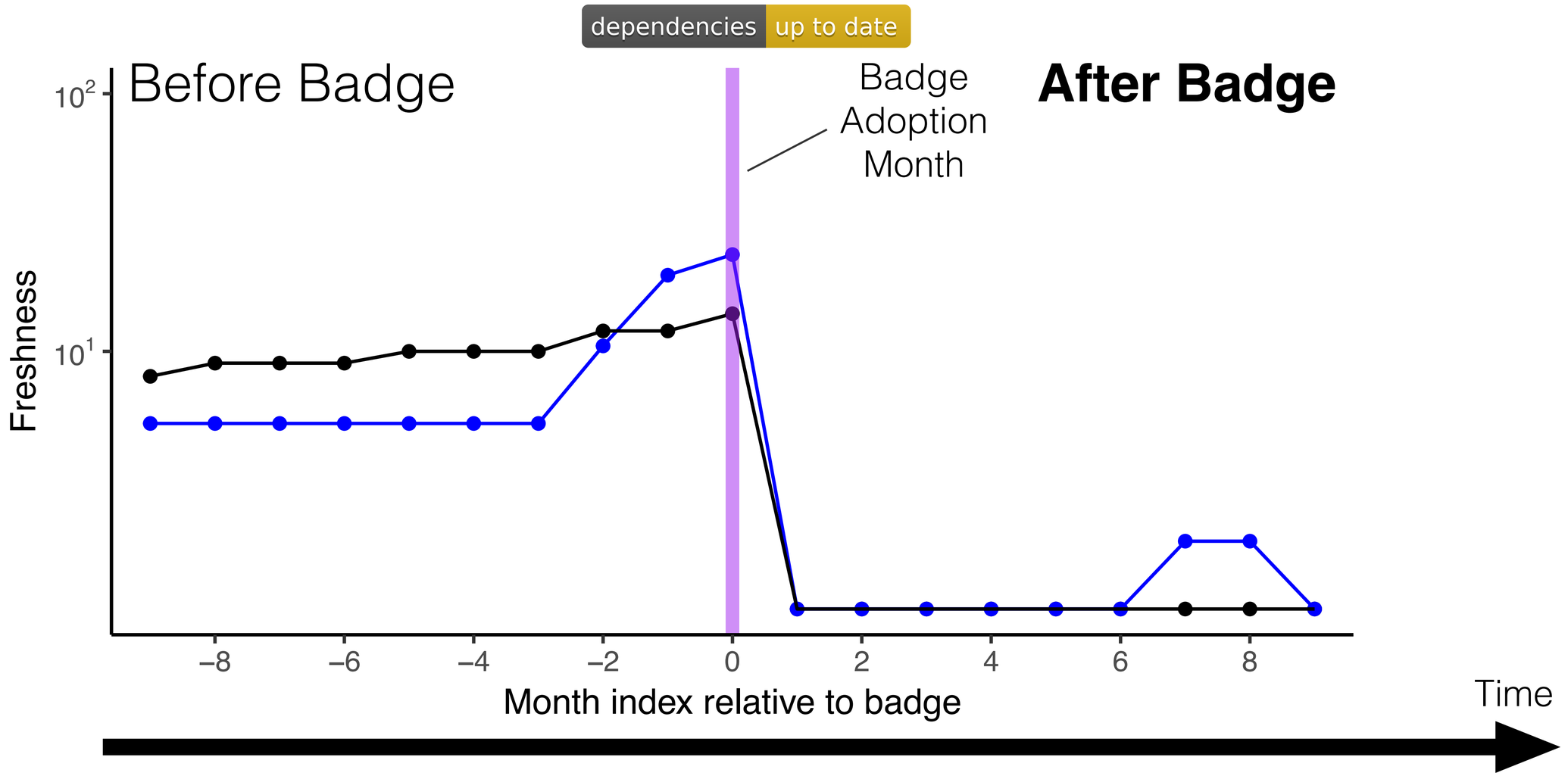
Step 3: Time Series Analysis

Signals of fresh dependencies



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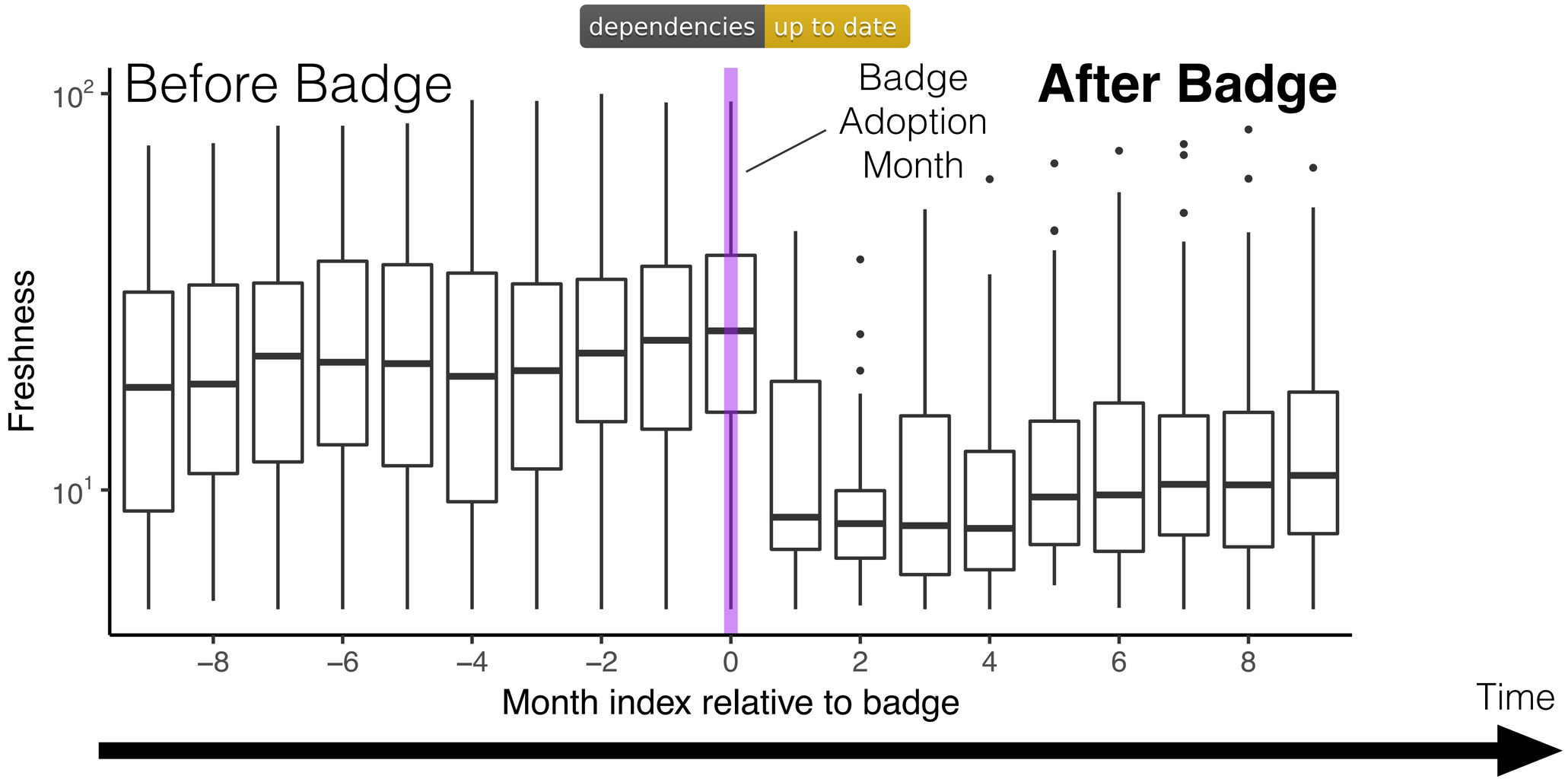
Signals of fresh dependencies



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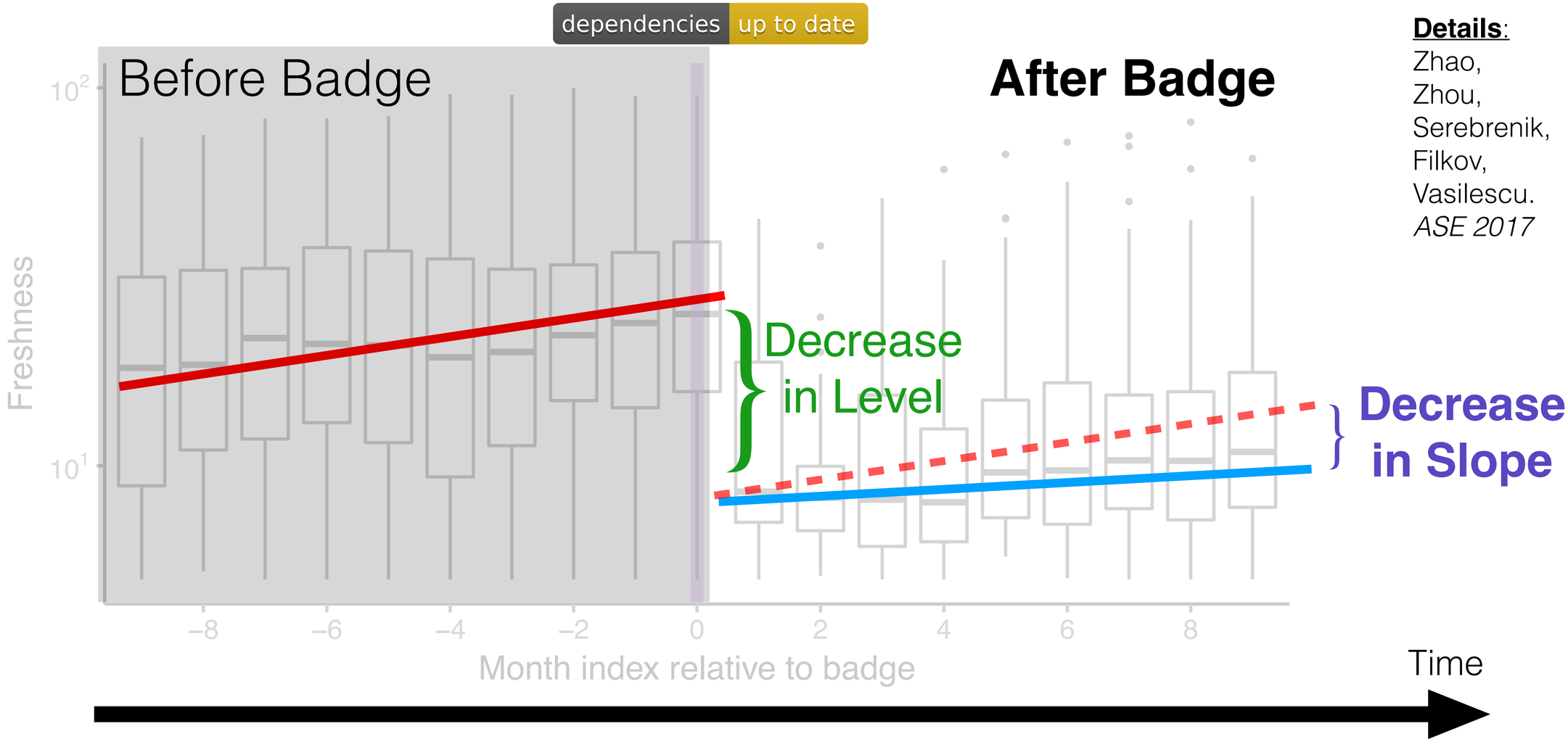
Step 3: Time Series Analysis

Signals of fresh dependencies



Details:
Zhao, Zhou, Serebrenik, Filkov, Vasilescu.
ASE 2017

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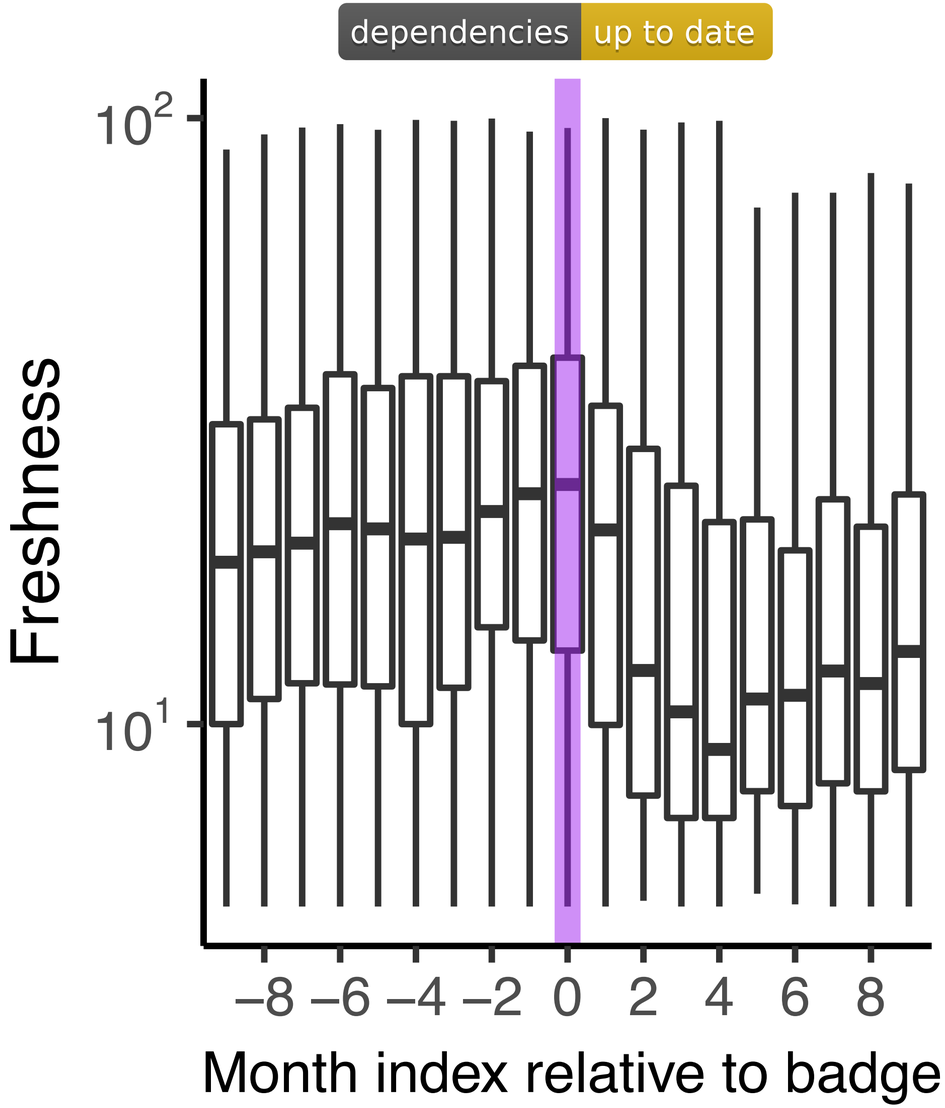
Step 3: Time Series Analysis

Signals of fresh dependencies

- **Based on survey:** The adoption of dependency management badges correlates with fresher dependencies
- **Freshness metric:** *lower* is better
  - (More up-to-date deps.)

Result: Dep. badges indicate *improved dep. management practices*



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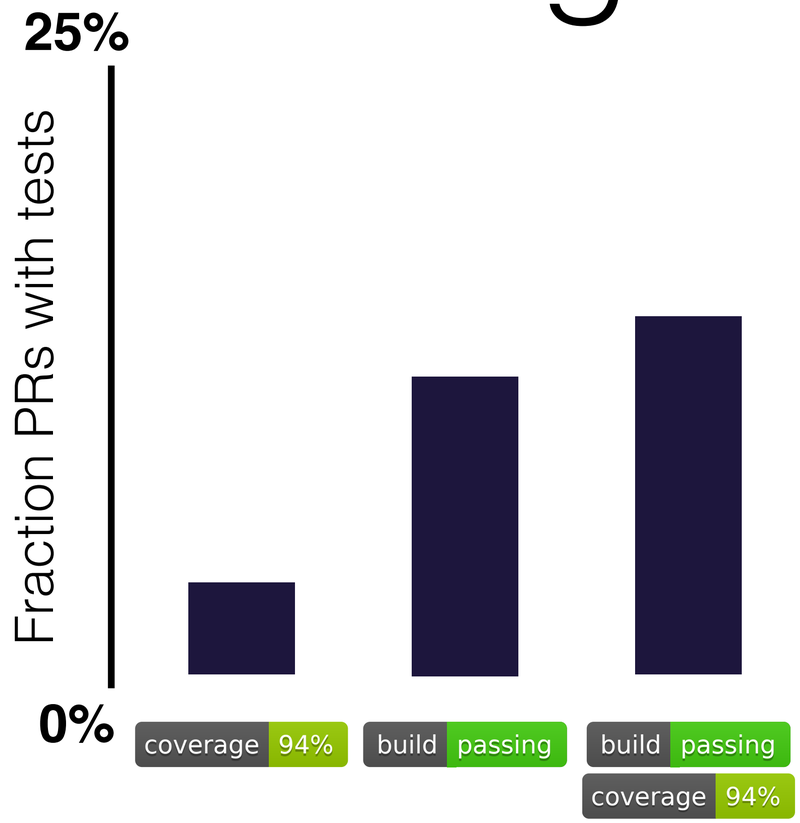
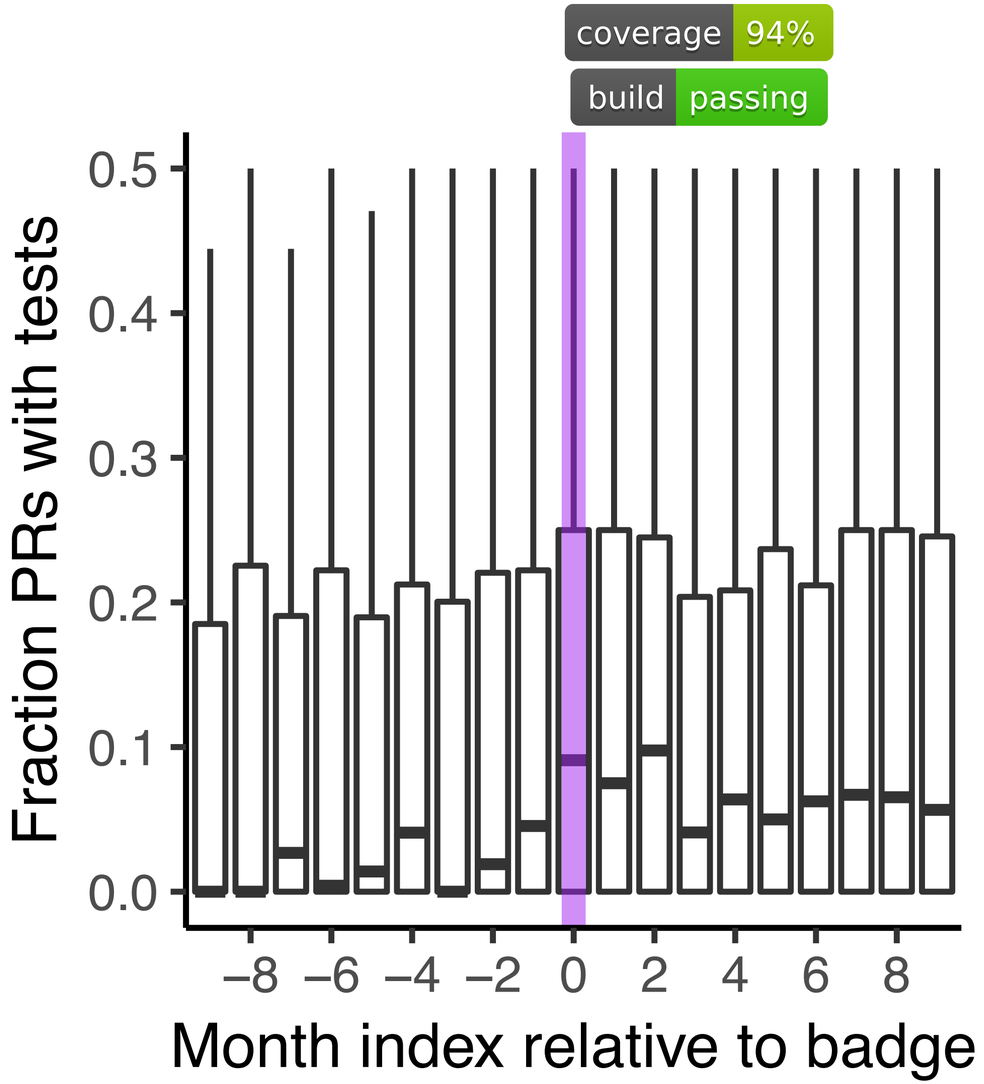
Signals of PR quality





Result: Build status+code coverage badges indicate *more tests in PRs*

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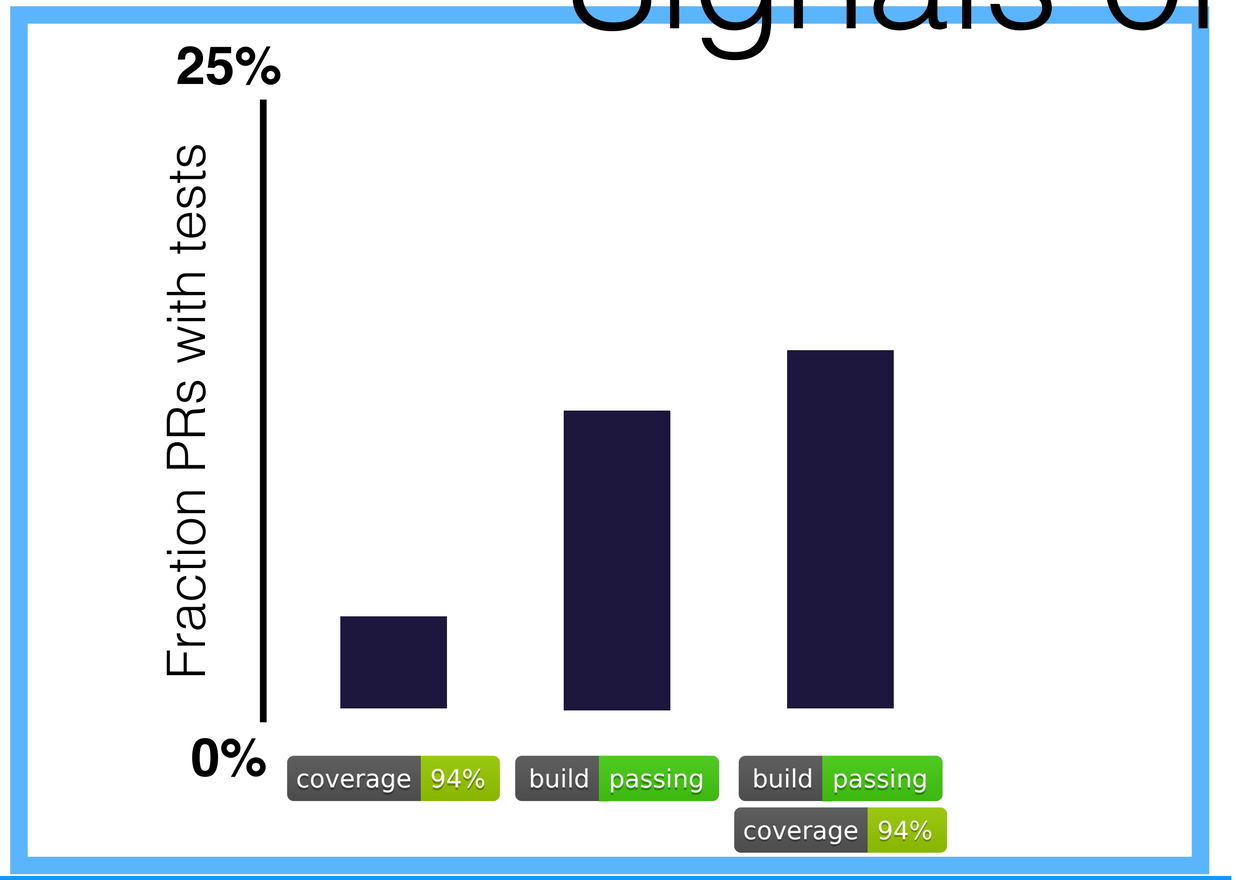

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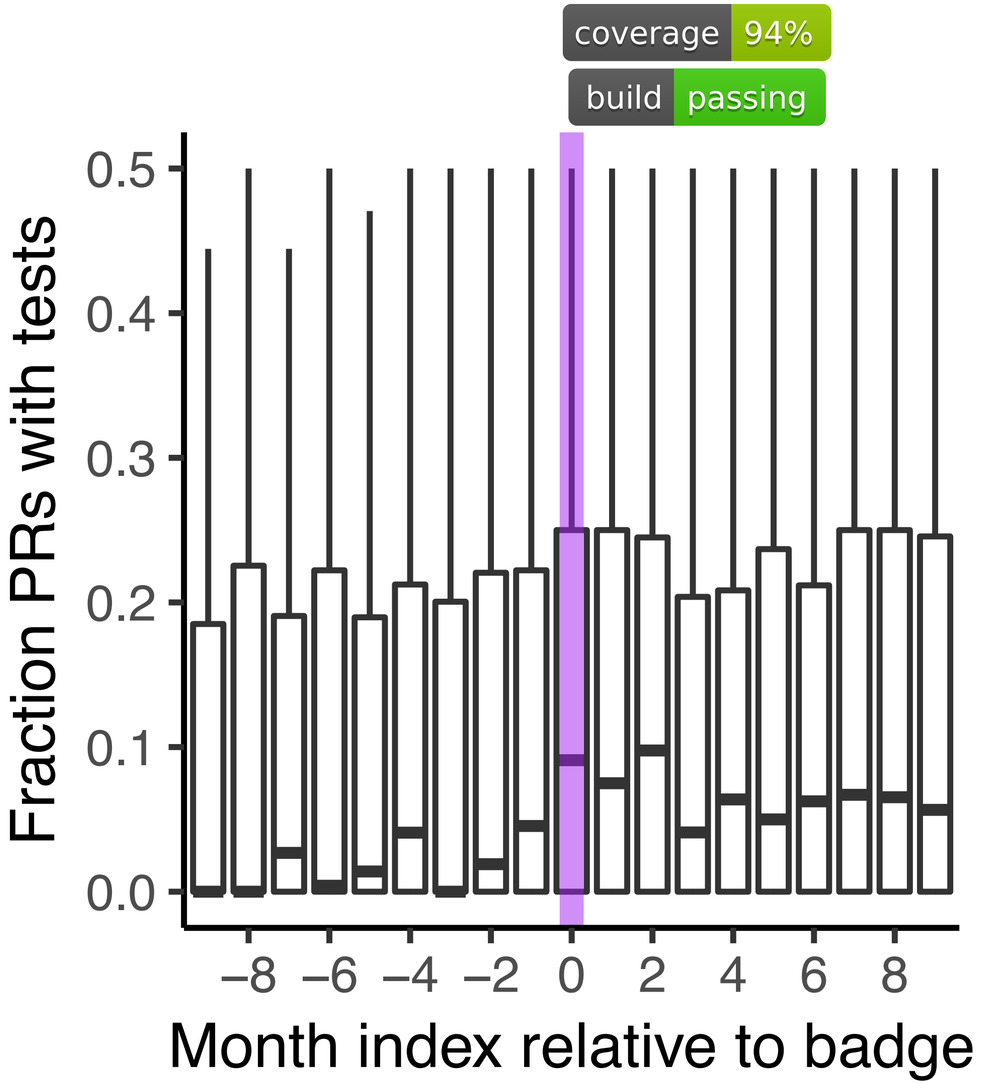

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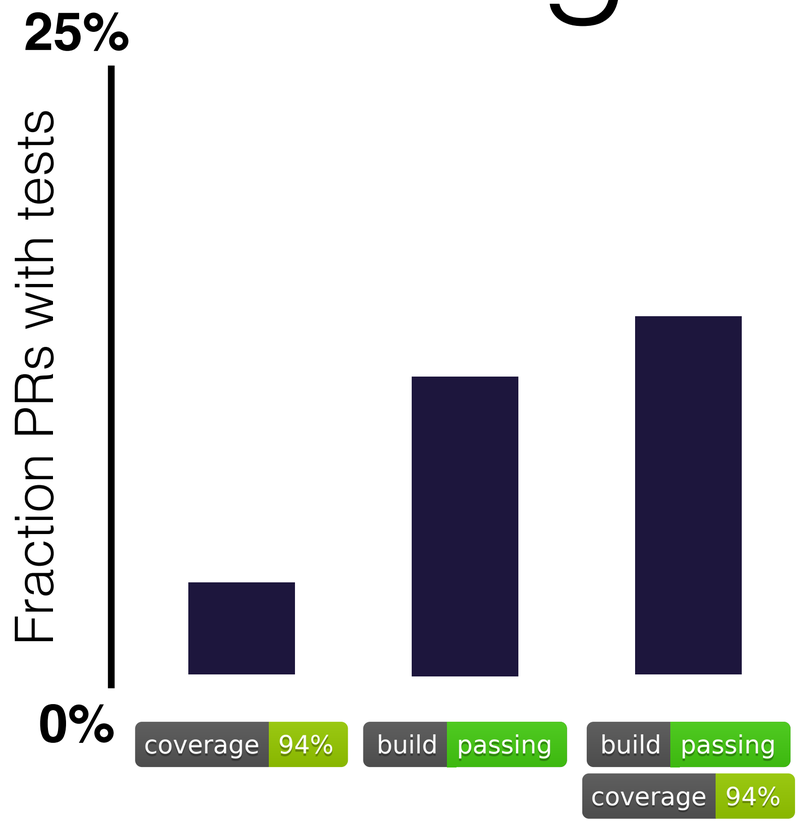

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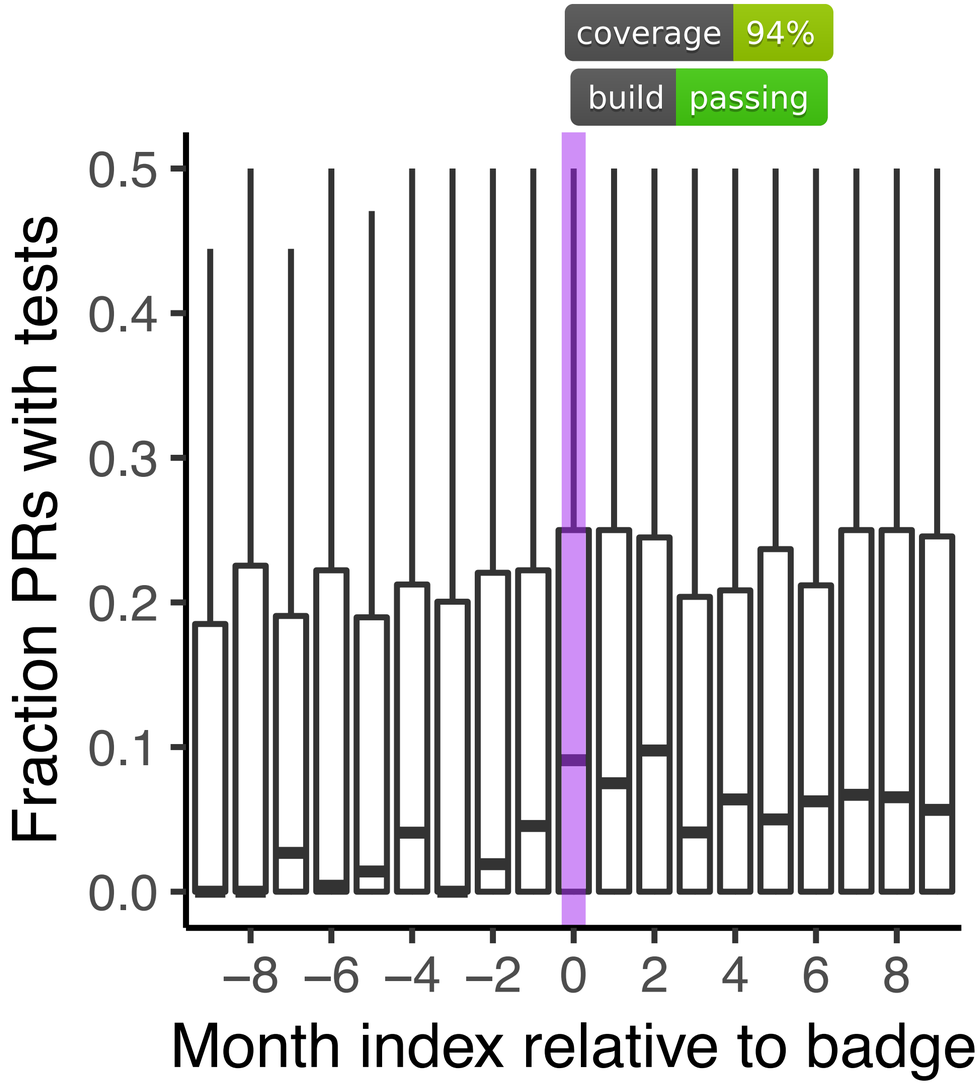

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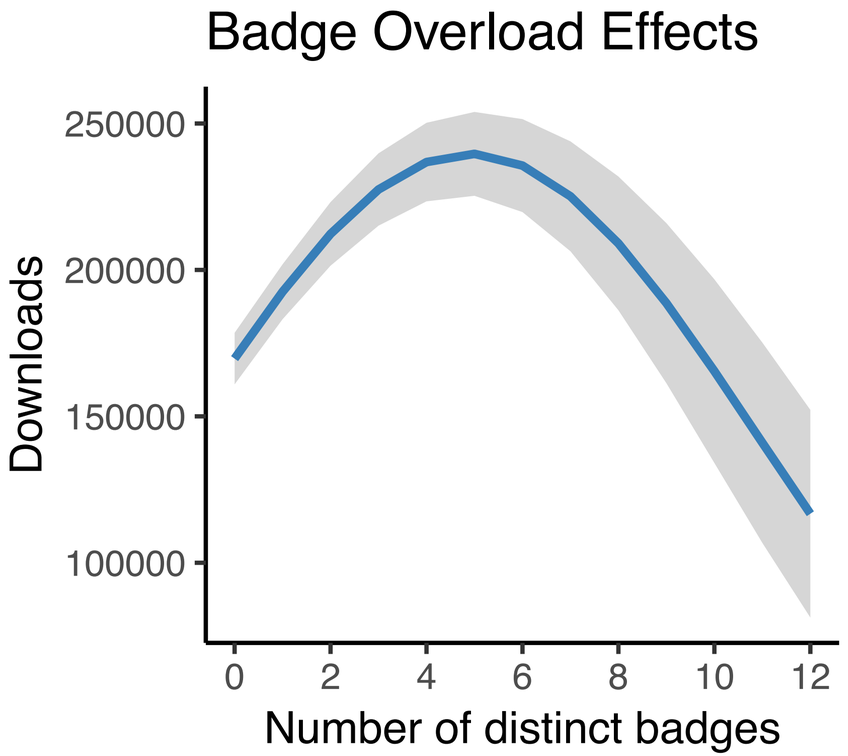
Too many badges?

- **Based on survey:**

“People tend to overwhelm visitors with too many (useless) badges, thus creating a contra effect and loosing the initial purpose of having useful information.”



Result: Attractiveness wears off beyond five badges

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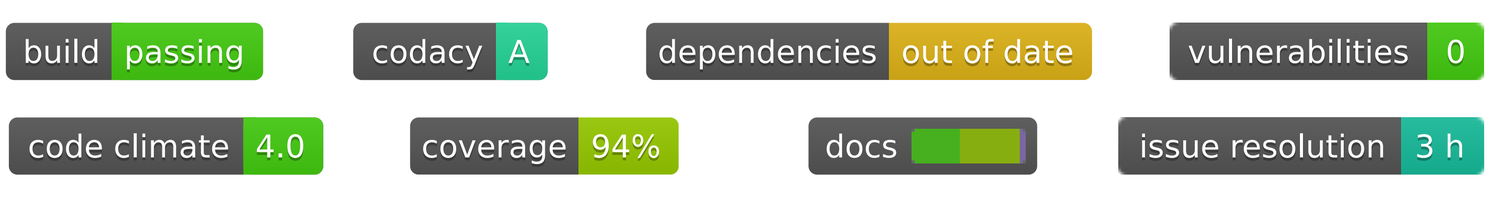
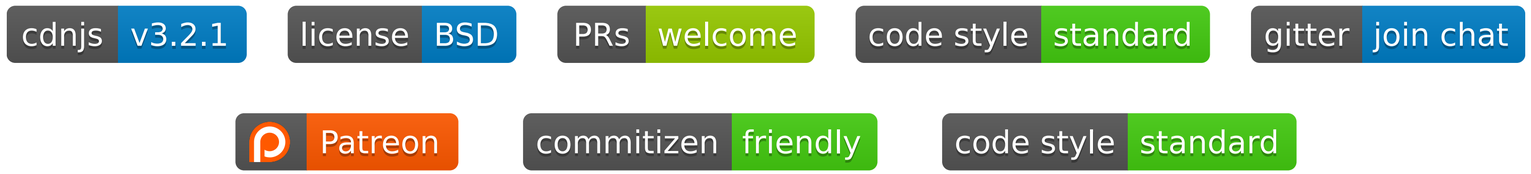
Take-aways

Badges with **underlying analyses:**



assessment signals

are **stronger predictors** than badges that merely state intentions or provide links:



conventional signals

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Take-aways

When possible,
design or choose the badge that takes the **most work:**

assessment signal

conventional signal

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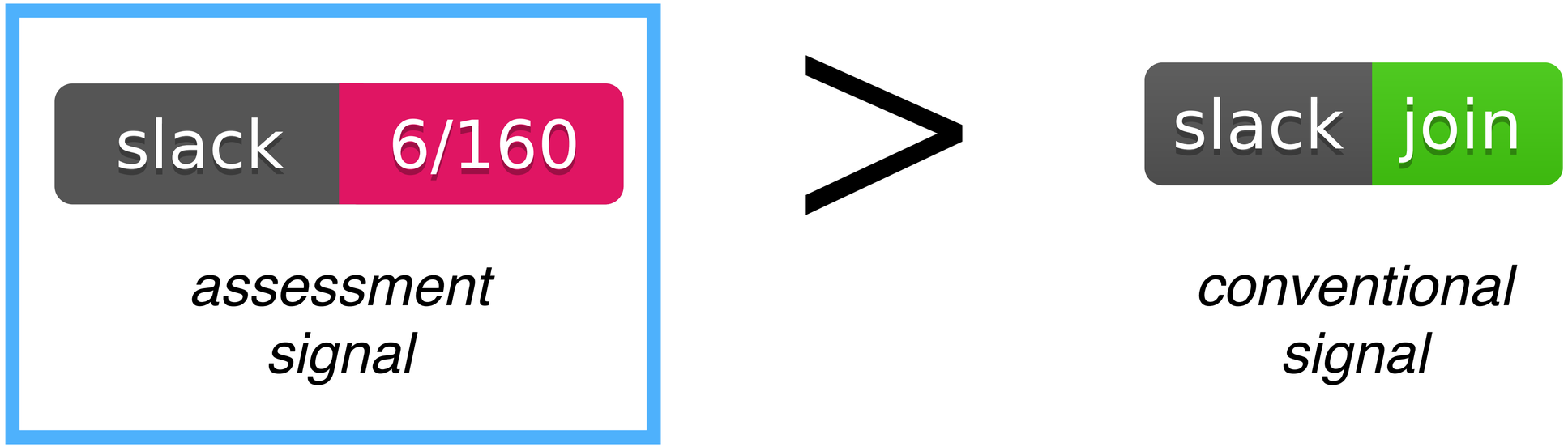
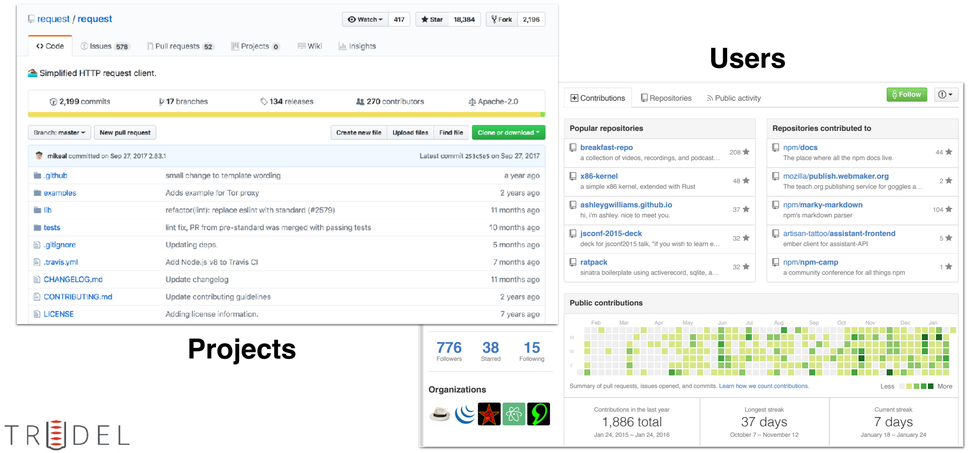


Adding Sparkle to Social Coding

badges | mostly reliable
https://cmustrudel.github.io/badges

Key features: Transparency & signaling



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Mixed methods study

Survey

- 32 maintainers, 57 contributors
- Maintainers:
  - What do you intend to signal?
  - What effects do you expect?
- Contributors:
  - What do badges tell you?

+

Repository Mining

- 294,941 *npm* packages
- Mined badge adoptions/removals from README files
- Measured proxies for code quality, test suite quality, popularity, dependency freshness, …

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Step 2: Time Series Analysis

Signals of fresh dependencies

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Take-aways

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