

# THE SOCIOLOGY OF PROGRAMMING LANGUAGES *adoption*

Leo A. Meyerovich, @lmeyerov, Graphistry  
Ariel S. Rabkin, @asrabkin, Cloudera

September, 2014

# Productivity



# Safety

# Perf.

# Confession of a Language Salesman

[P. Coburn]

**Change Function** threshold to adopt:

$$\frac{\text{perceived adoption need}}{\text{perceived adoption pain}} > 1$$

**Haskell 98**

*FP!!!*

---

*new language*



# Confession of a Language Salesman

“From now on, my goal in life  
would be to also drive the  
**denominator down to zero”**

- Erik Meijer

*Confessions of a Used Programming Language Salesman*



# Confession of a Language Salesman

[P. Coburn]

**Change Function** threshold to adopt:

$$\frac{\text{perceived adoption need}}{\text{perceived adoption pain}} > 1$$

Haskell 98

*FP!!!*  
new language



*FP!!*  
familiar language





## Software



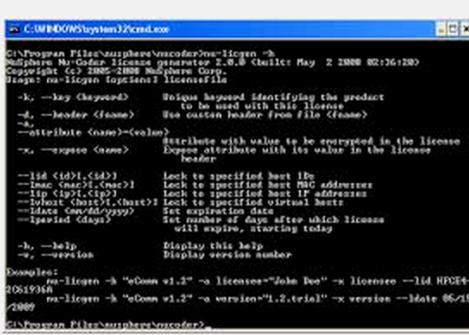
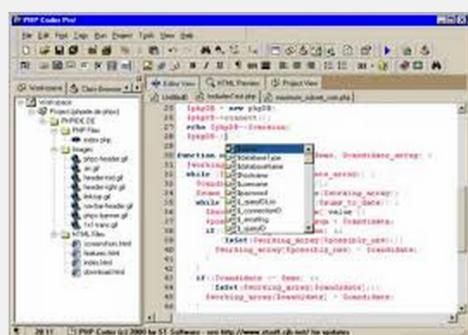
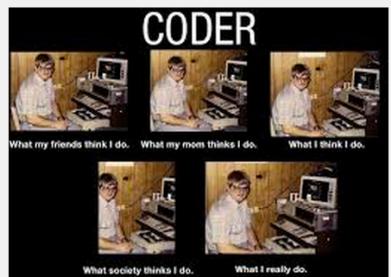
## Nerd



Medical



## Computer



{CODE}  
IT'S FUN



## Computer



Anonymous



Logo



Cybercha



# ENIAC





Design smarter by  
exploiting  
social foundations  
empiricism + theory

# How do languages grow?



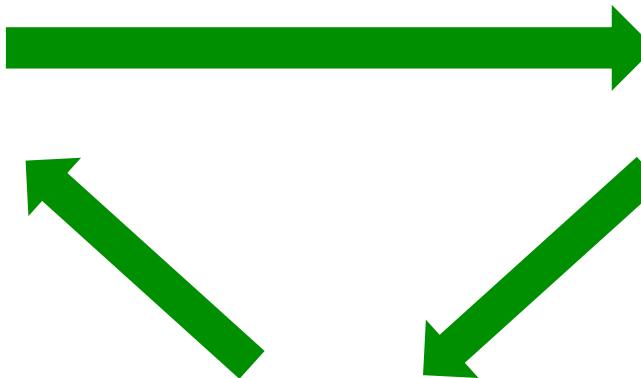
# Ecological Model of Adoption



# Ecological Model of Adoption



Use language  
in a niche



Grow libraries  
and user base



Spread language to more niches

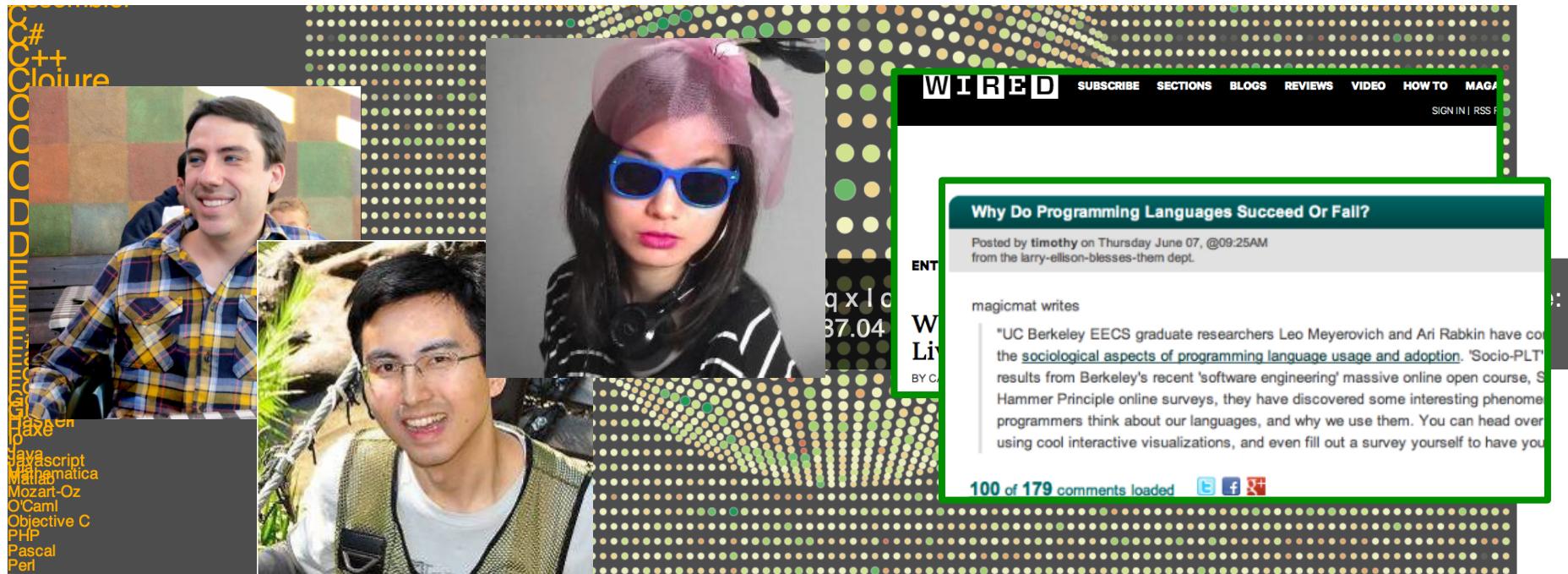
# Our Data

[McIver]

2 year long web survey  
13,271 respondents



2 week web survey  
1,679 respondents



# 200K



# Projects (2000-2010)

The screenshot shows a project page for "SQuirreL SQL Client". At the top left is a thumbnail image of two squirrel heads. To its right is the project name "SQuirreL SQL Client" and the names "colbell, gerdwagner" below it. A green oval highlights this area. Below this is a summary section with a heart icon and the text "251 Recommendations", a download icon and "136,596 Downloads (This Week)", and a calendar icon with the text "Last Update: 2012-08-13". To the right is a "Download fw.jar" button with the SourceForge logo. Below the summary are social sharing links for Twitter ("Tweet" with 0), Google+ ("+1" with 11), and Facebook ("Like" with 11). To the right of these are icons for Windows, Mac OS X, and Linux. A horizontal line separates this from the "Description" section.

## Description

SQuirreL SQL Client is a graphical SQL client written in Java that will allow you to JDBC compliant database, browse the data in tables, issue SQL commands etc.

[SQuirreL SQL Client Web Site >](#)

Categories  
Front-Ends

License  
GNU General Public License

## Additional Project Details

### Languages

English

### User Interface

Cocoa (MacOS X), Win32 (MS Windows), X Window System (X11)

### Intended Audience

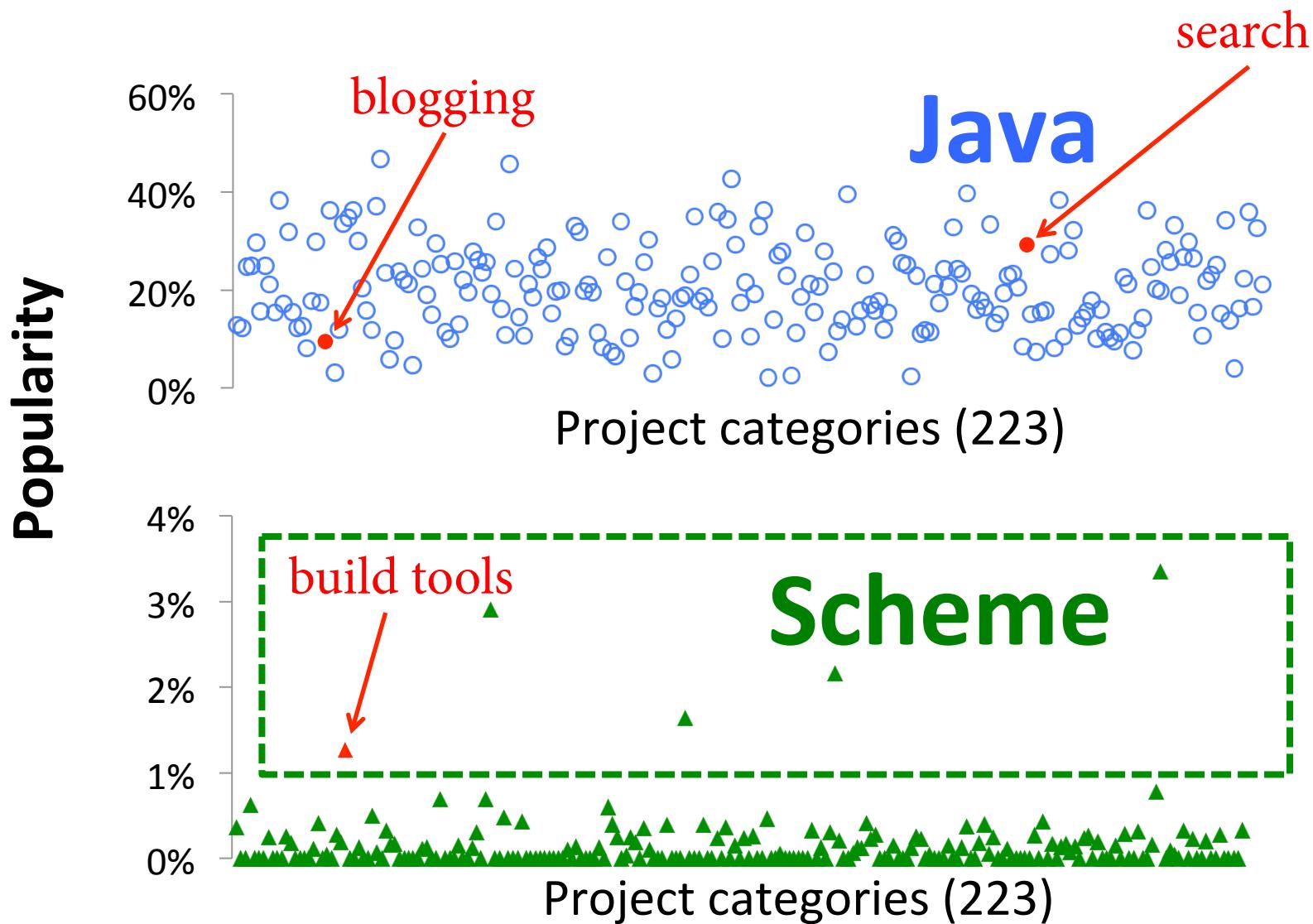
Developers, Information Technology, System Administrators

### Programming Language

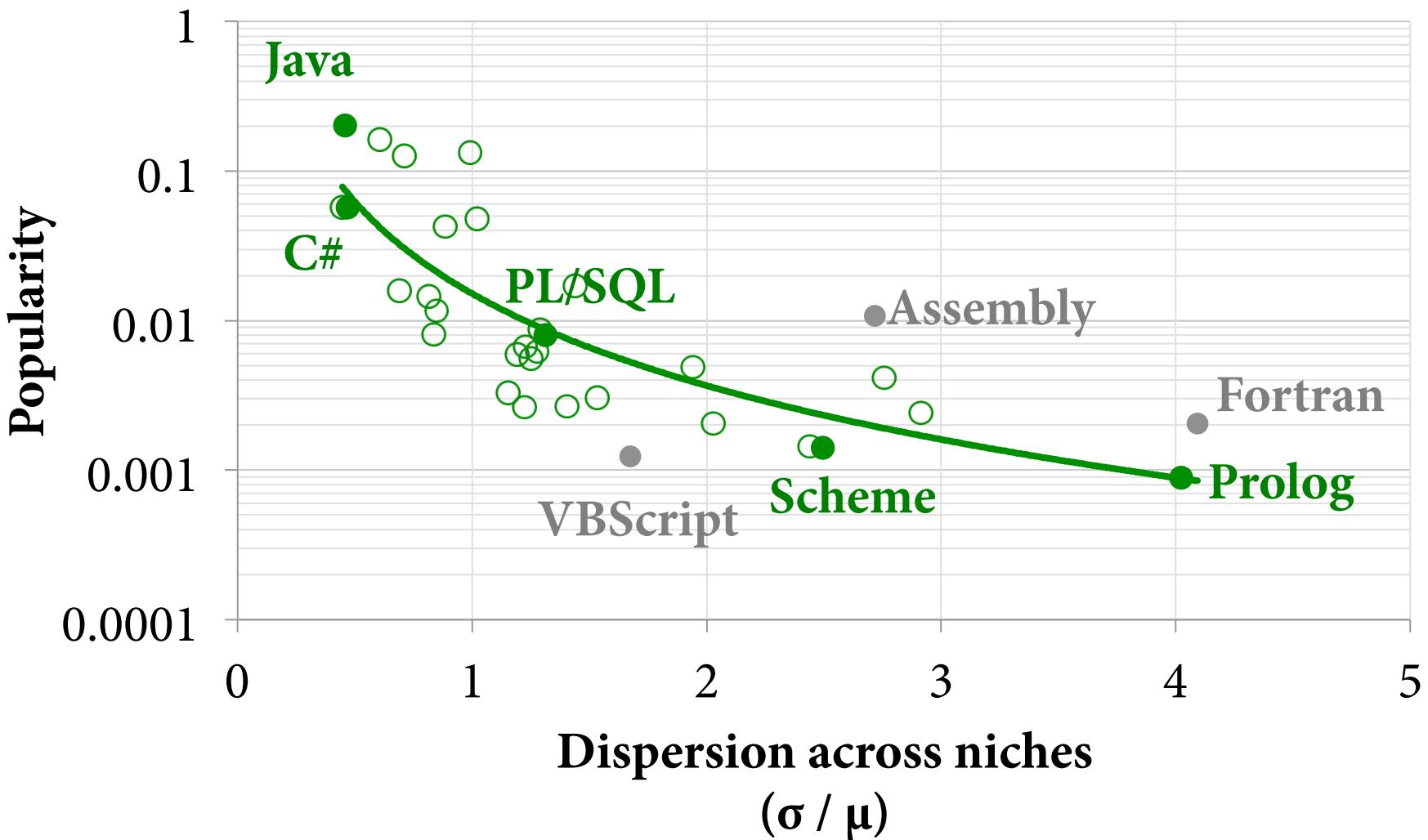
Java  
Registered

2001-05-31

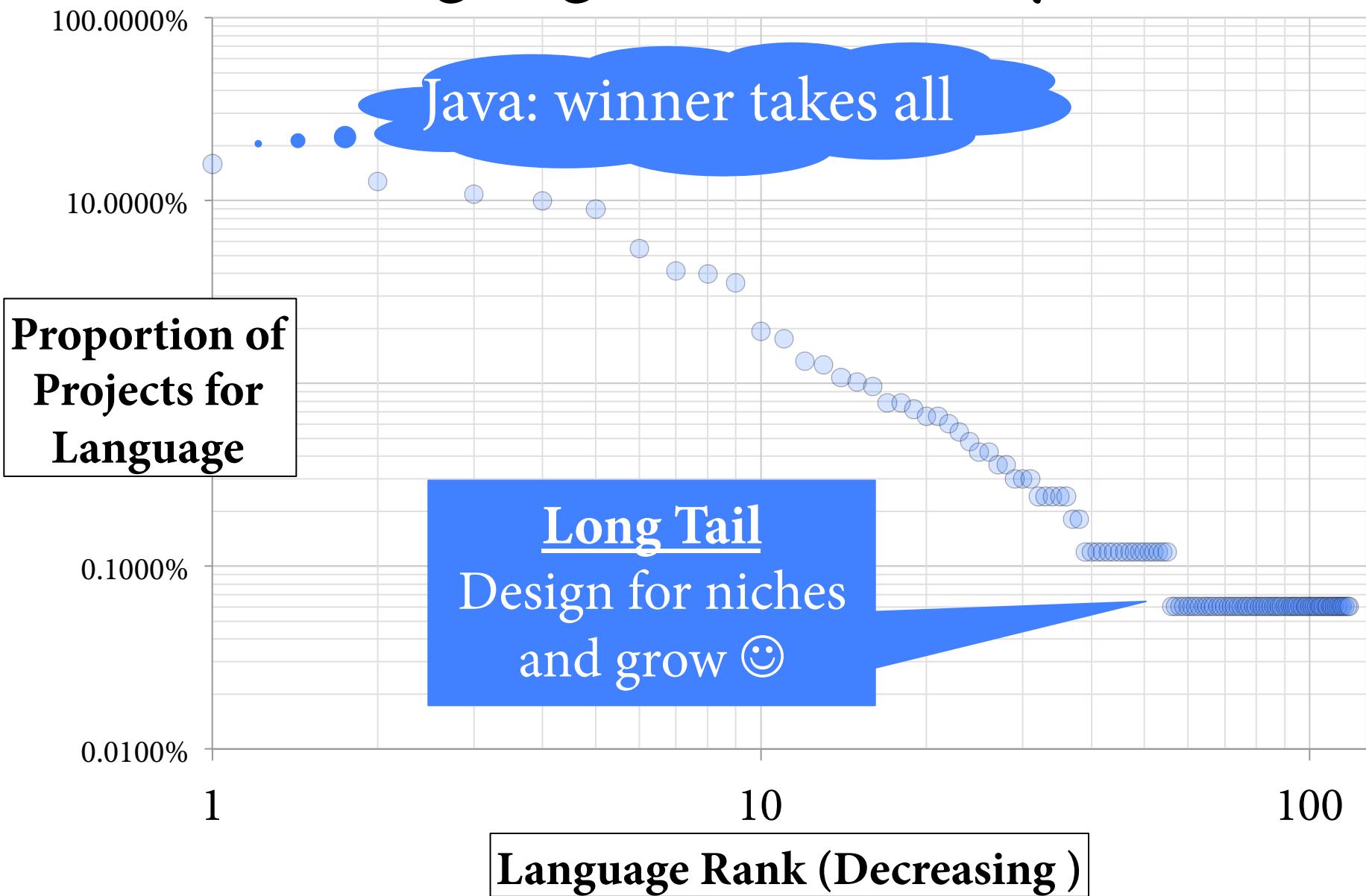
# Popularity Across Niches



# Popularity vs. Niche: Dispersion



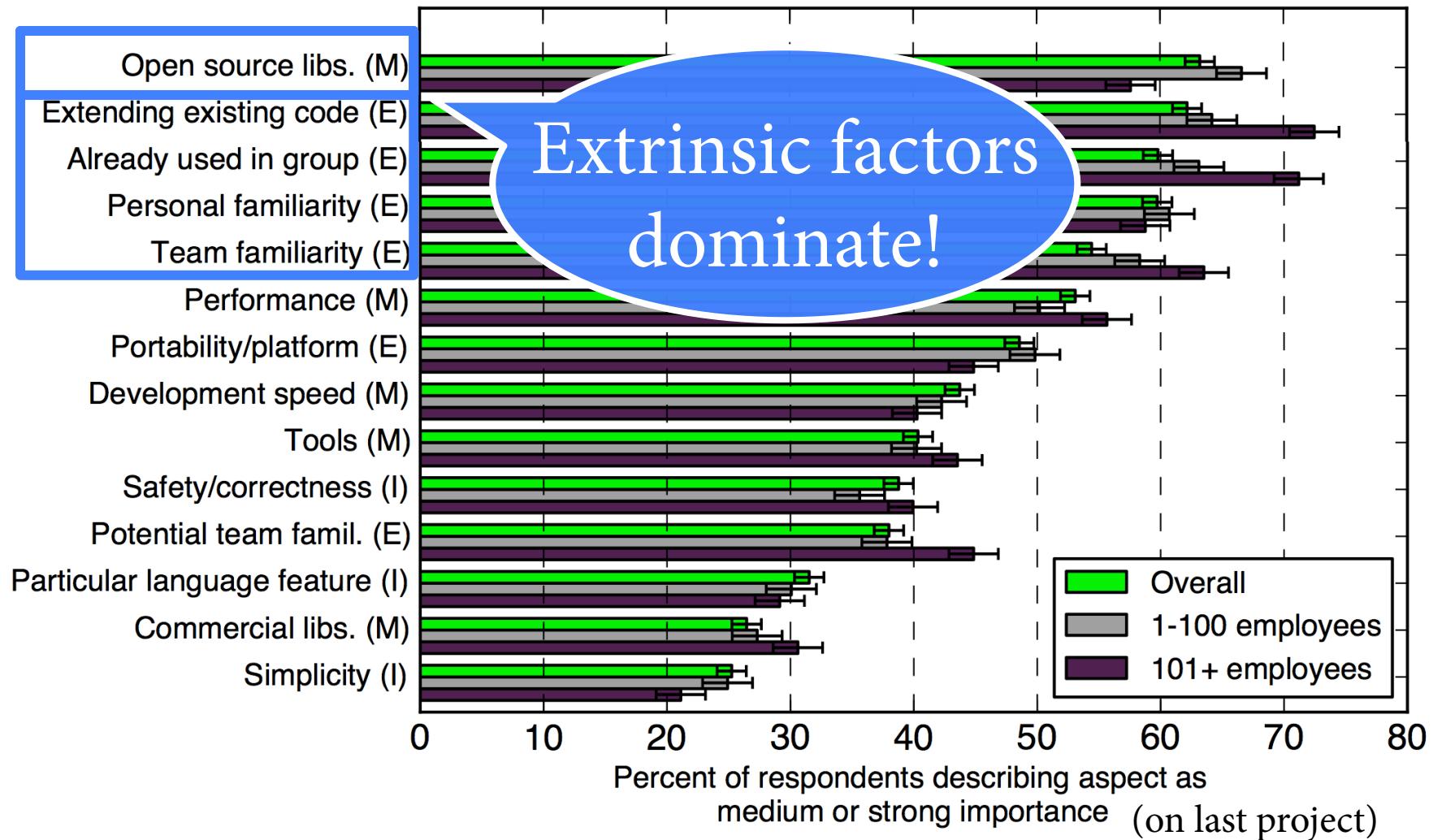
# Language Use (survey)



# How Do We Actually Pick Languages?



# Survey of 1,679 Developers



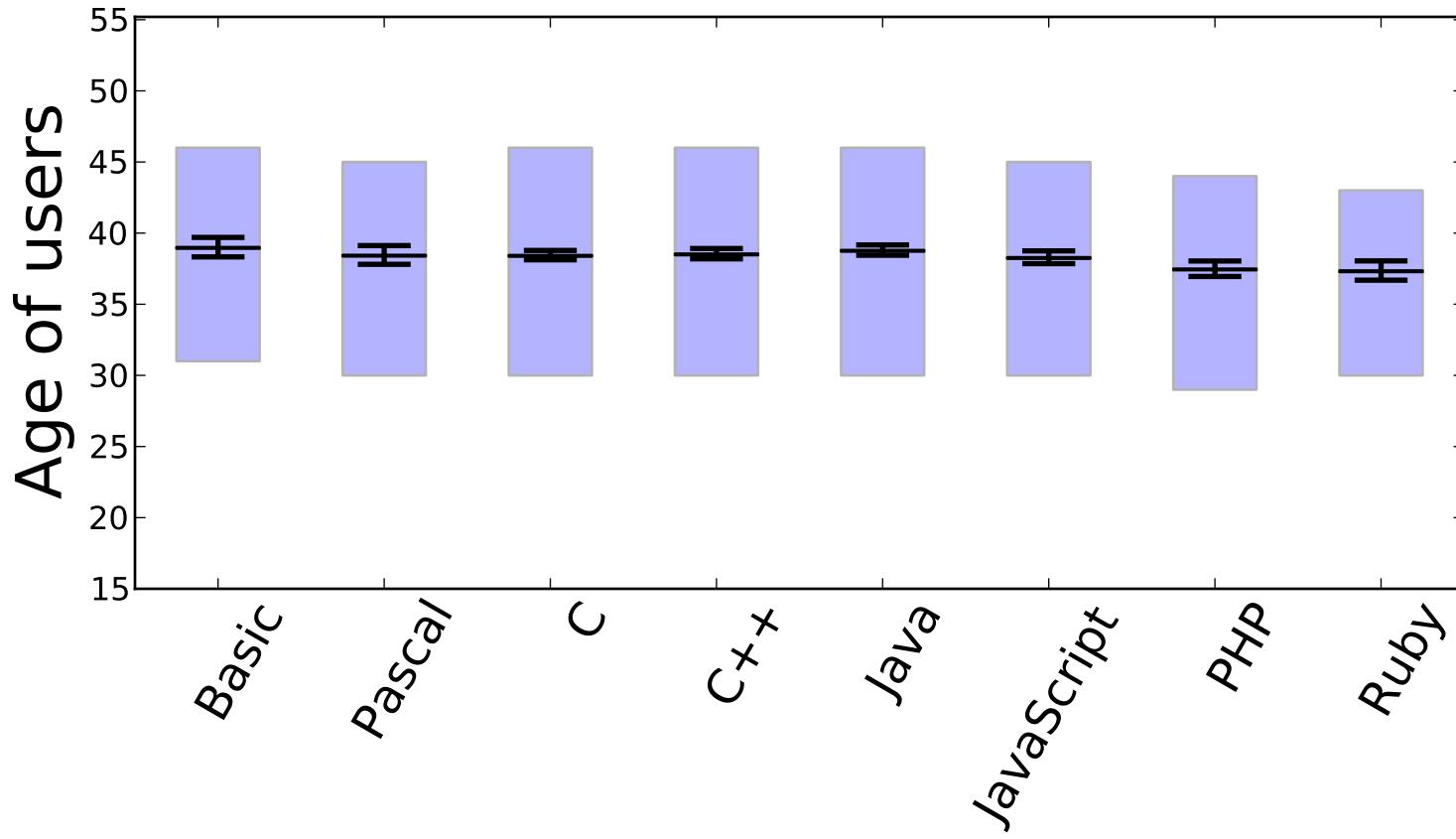
# Learning: Shelf Life of a Programmer?

The New York Times Technology | Personal Tech | Business Day

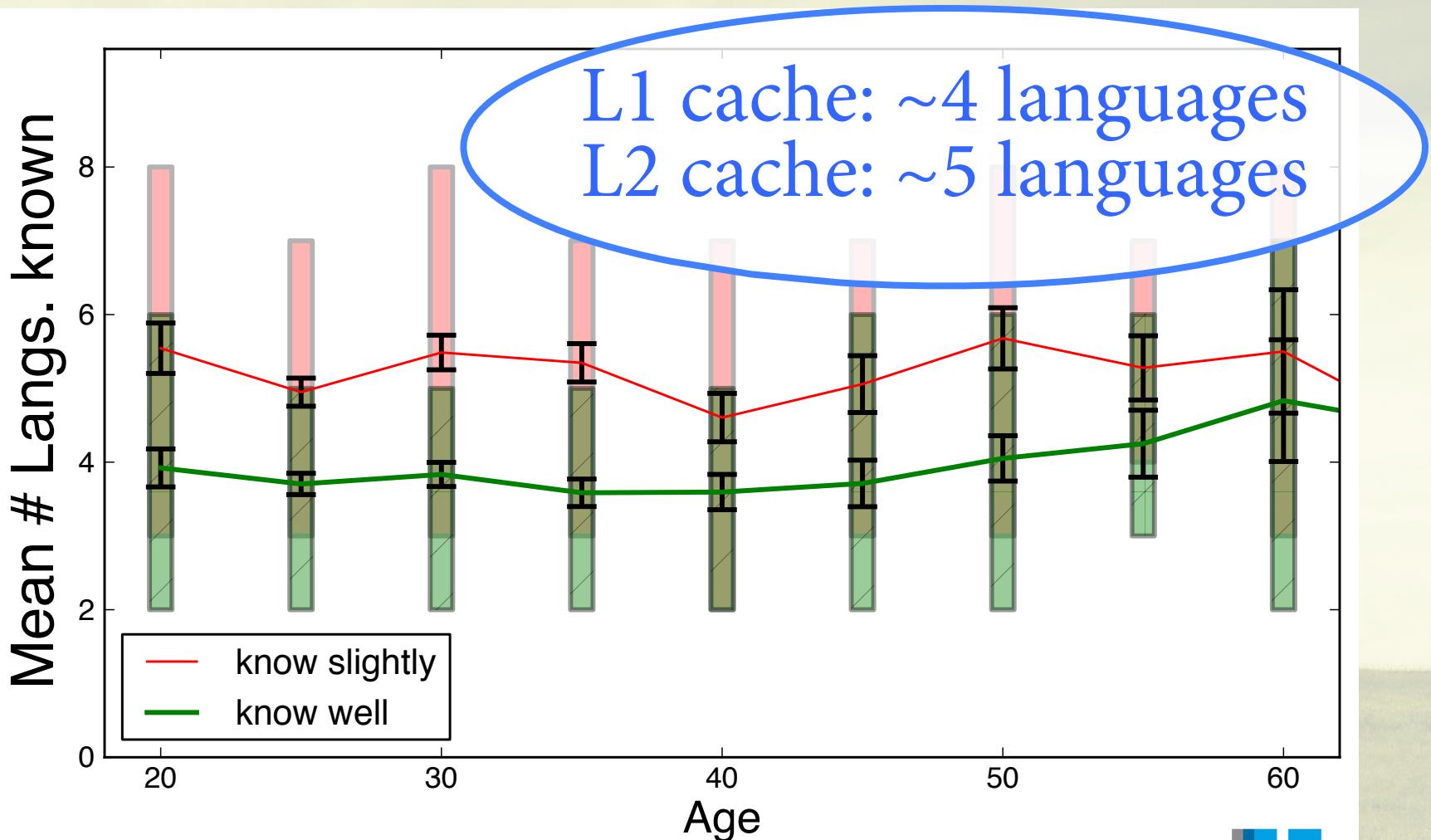
“Baby Boomers and Gen Xers  
tend to know C# and SQL.  
Gen Y knows Python... and Hadoop”

*Recruiter*

# Knowledge is Age-Invariant

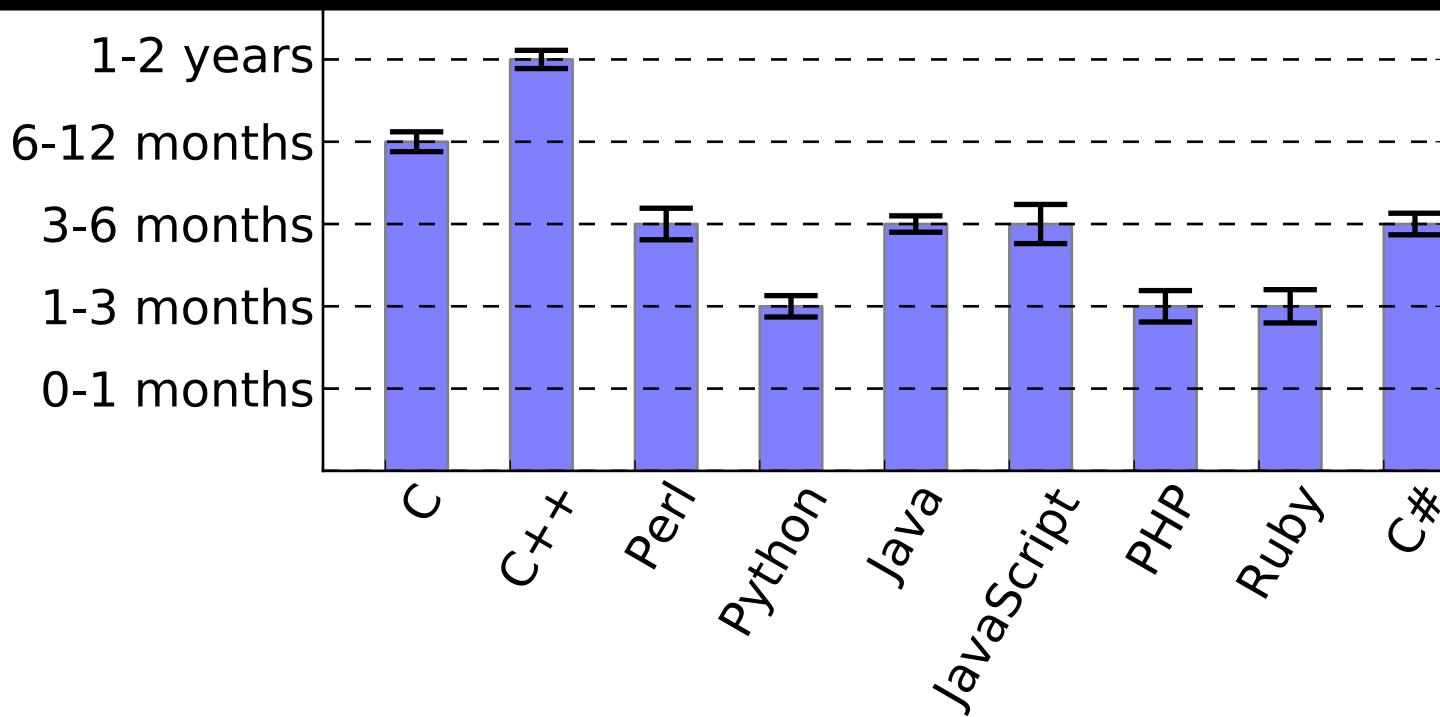


# We learn and forget

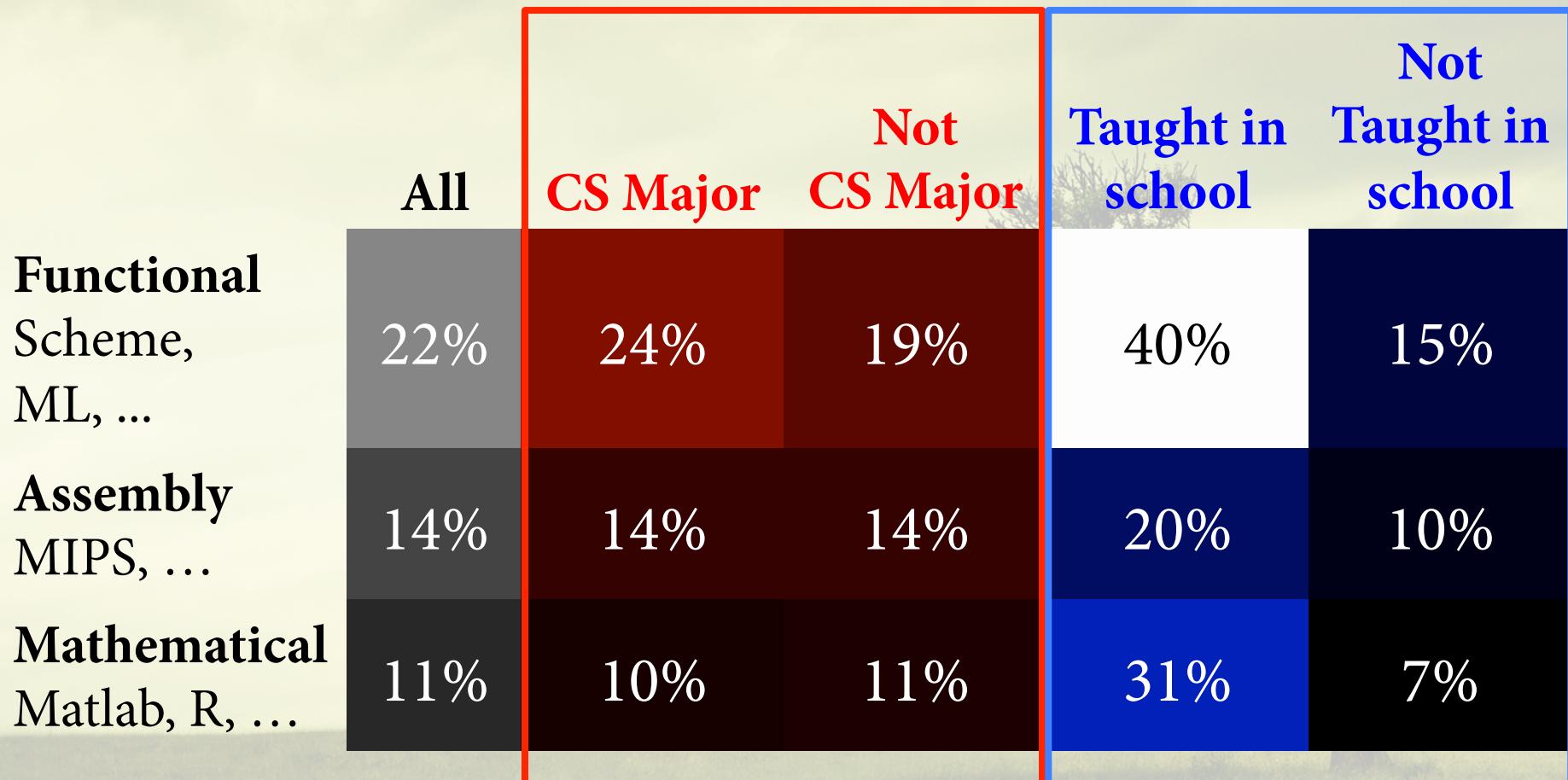


# Median reported time required to “learn a language well”

Can learn managed languages on the job



# Probability of Knowing a Language



**CS degree unimportant but coursework matters**  
“Learn at least half a dozen languages. One that...”

– Peter Norvig<sup>24</sup>

# Detailed Model: Diffusion of Innovation



500+ tech adoption studies later...

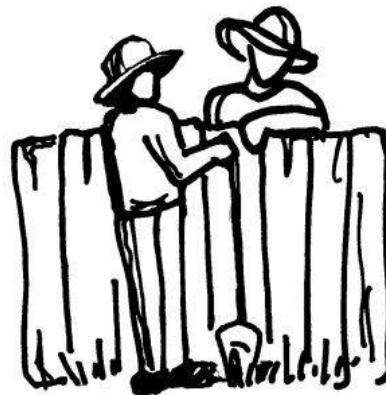
# Diffusion of Innovation: **Process**

## 1. Knowledge



*not so bad*

## 2. Persuasion



*talk + read*

## 3. Decision



## 4. Trial



## 5. Confirmation



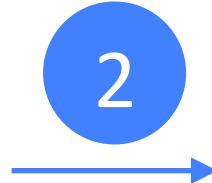
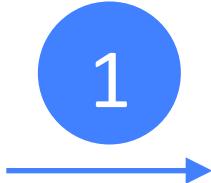
# Diffusion Catalysts: Safe Sex Case Study

feels like  
static typing...

- ✓ relative advantage and simplicity
- ✗ observability
- ✗ trialability and compatibility

# Two Weekends to Spread Safe Sex

hang out at gay bars,  
identify **opinion leaders**



teach to promote,  
give visible badge

**3 yr A/B Test:** +15% safe sex, -15% unsafe sex

# Designs that Diffuse

**Trialability**  
Coverity

**Relative advantage**  
Hadoop, JavaScript

**Compatibility**  
Scala

**Observability**  
JavaScript

**Simplicity**  
JavaScript

# Adoption-Powered Design

Productivity

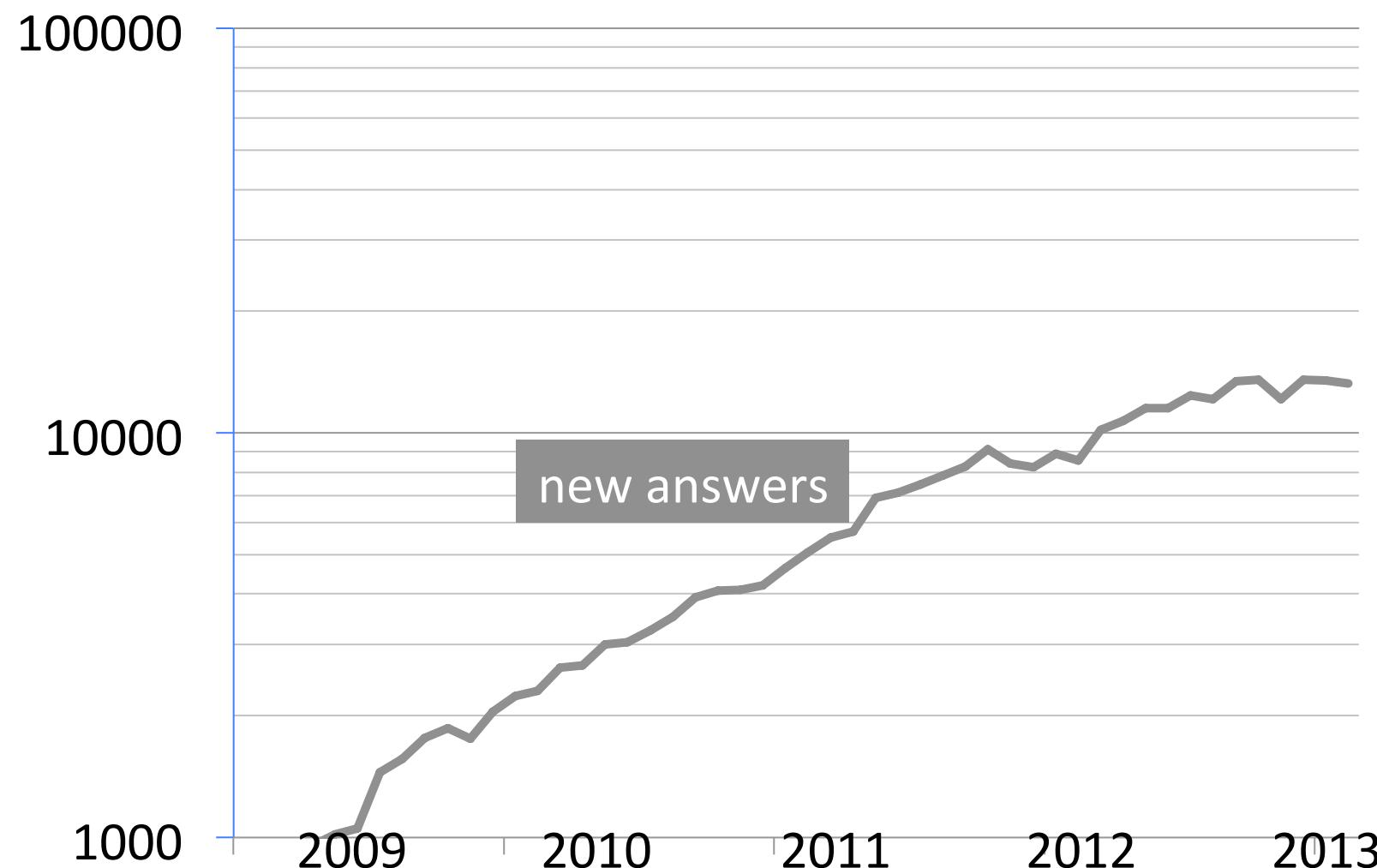
$\lambda$

Safety

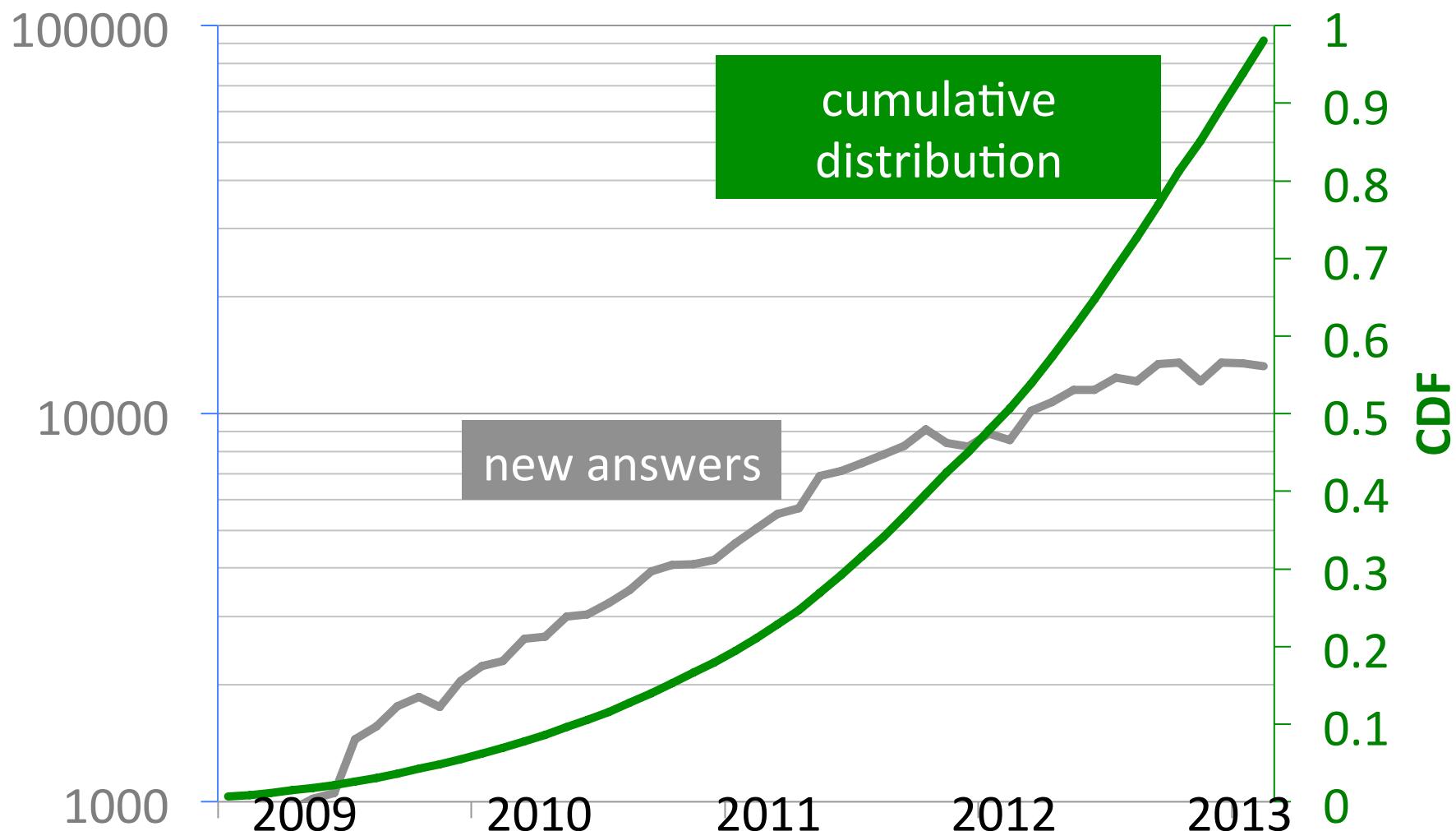
Perf.



# JavaScript Posts over Time on



# JavaScript Posts over Time on



# Productivity: Guided REPLs/APIs

Useful?

Others?

Preprocessing?

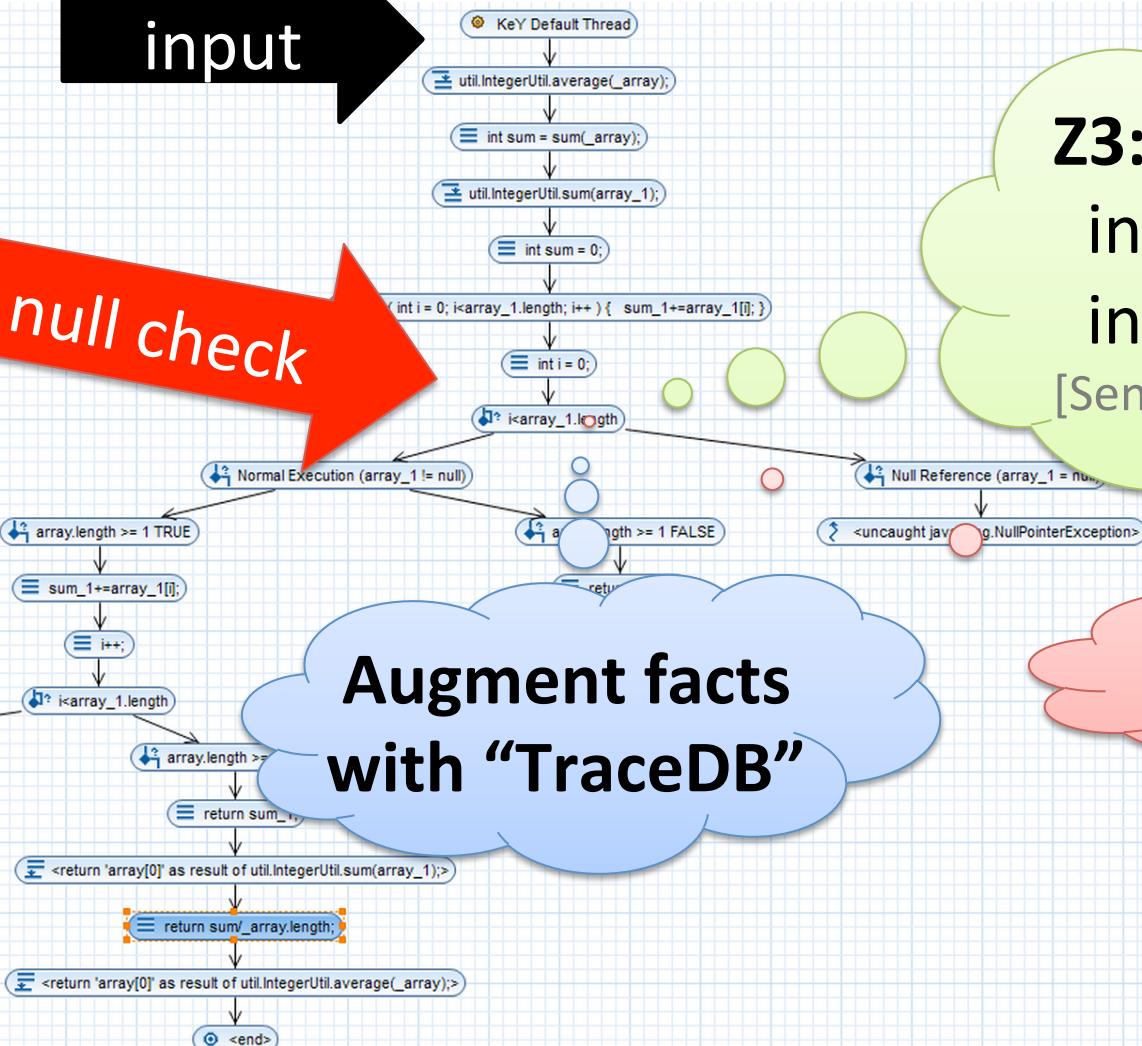
```
install("fit"); import("fit")
a = fitdistr(data, distr="exp")
plot(a); summary(a)
```

Postprocessing?

Others?

# Safety: Traces for Whitebox Testing

input



Augment facts  
with “TraceDB”

Z3: synthesize  
input1 for **null**  
input2 for **!null**  
[Sen, Engler, Godefroid..]

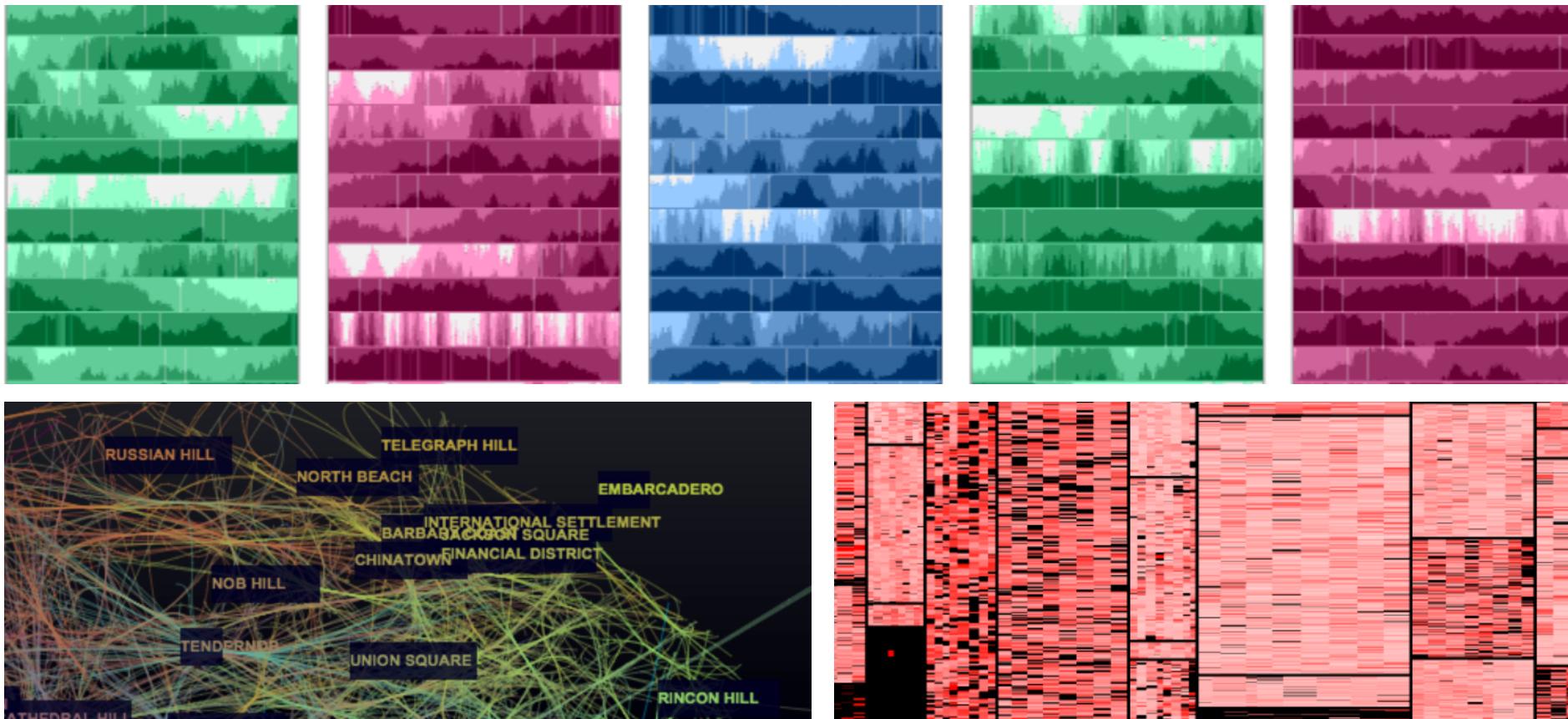
Synth can fail..

Scientific tools  
for grasping social nature  
empiricism + theory

and designing better  
features, models, process

# GRAPHISTRY

Explore millions of data points in real-time



GPU cloud streaming is coming to a browser near you!

$P(L' | L)$



$p(\text{popular})$   
75%

$p(\text{prev})$   
30%

