Automatically assembling a census of an academic field

Allison Morgan
University of Colorado, Boulder

with Samuel Way and Aaron Clauset

About Me

Second year PhD Student in CS at CU Boulder

Collaborators and I study the "sociology of science"

Interested in computational methods to study under-representation in academia

RESEARCH ARTICLE

NETWORK SCIENCES

Systematic inequality and hierarchy in faculty hiring networks

Aaron Clauset,[1,2,3]* Samuel Arbesman,[4] Daniel B. Larremore[5,6]

Science Advances 1(1), e1400005, 2015.

Gender, Productivity, and Prestige in Computer Science Faculty Hiring Networks

Samuel F. Way,[1,*] Daniel B. Larremore,[2,†] and Aaron Clauset[1,3,2,‡]

[1]*Department of Computer Science, University of Colorado, Boulder CO, 80309 USA*
[2]*Santa Fe Institute, Santa Fe NM, 87501 USA*
[3]*BioFrontiers Institute, University of Colorado, Boulder CO, 80303 USA*

Proc. 25th Int'l World Wide Web Conf. (WWW), (2016)

The misleading narrative of the canonical faculty productivity trajectory

Samuel F. Way[a,1], Allison C. Morgan[a], Aaron Clauset[a,b,c,2], and Daniel B. Larremore[a,b,c,1,2]

[a]Department of Computer Science, University of Colorado, Boulder, CO 80309; [b]BioFrontiers Institute, University of Colorado, Boulder, CO 80303; and [c]Santa Fe Institute, Santa Fe, NM 87501

Proceedings of the National Academy of Sciences Oct 2017, 201702121

Motivation

Nobel Prize winners

Chemists

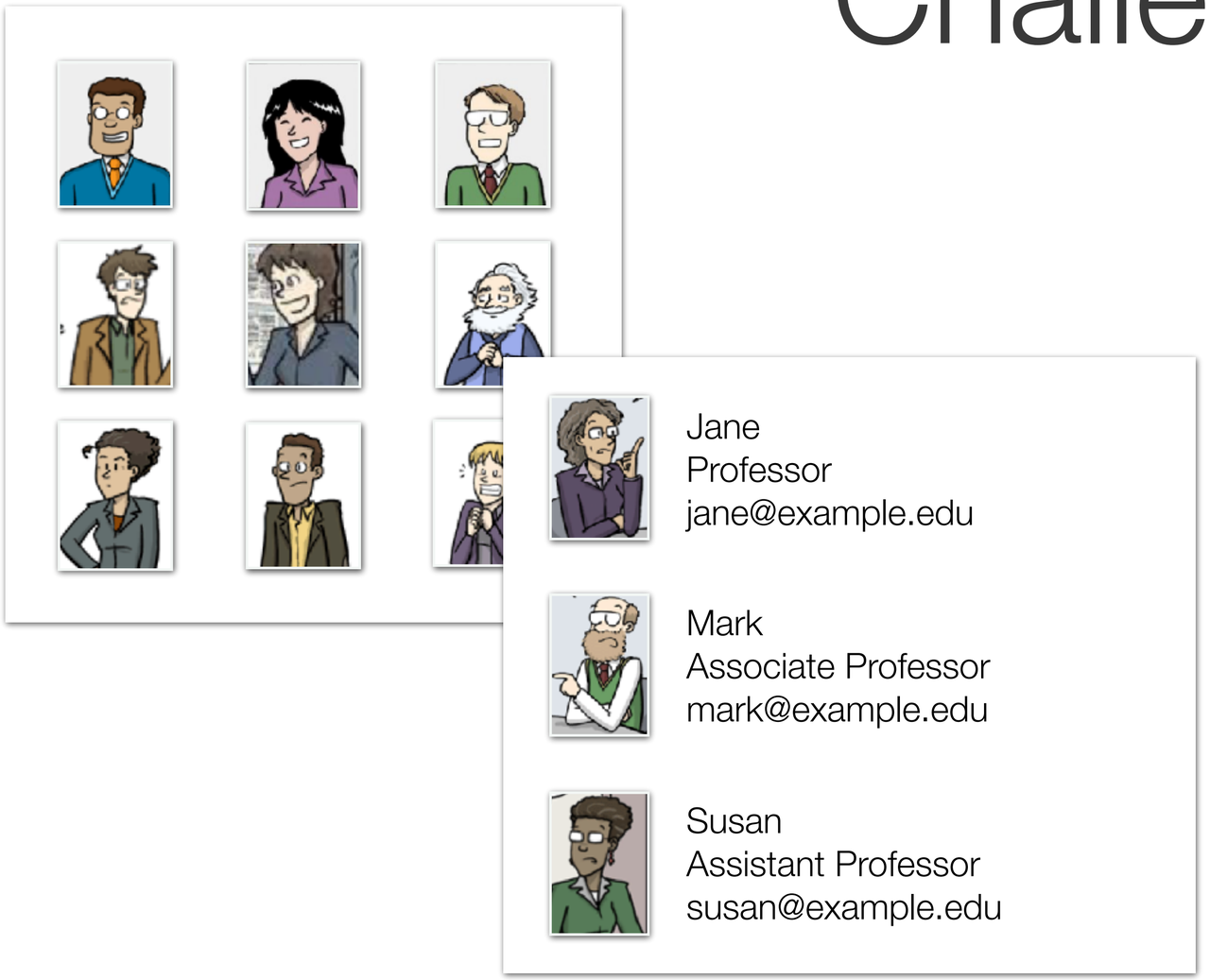
and those who leave academia

Cartoons by Jorge Chan; phdcomics.com

Much of the sociology of science studies small samples of the academic workforce at a single point in time.

Can we build a tool to efficiently collect the employment information of **all faculty** across institutions, **across time**?

Challenge



Jane
Professor
jane@example.edu

Mark
Associate Professor
mark@example.edu

Susan
Assistant Professor
susan@example.edu

Every department contains a public directory of its faculty

With the same information: names, titles, email addresses, and webpages

But, information is distributed and not well structured

Cartoons by Jorge Chan; phdcomics.com

Our Approach

Department Homepage

Courses | Faculty …

Start from department homepage

Jane
Professor
jane@example.edu

Mark
Associate Professor
mark@example.edu

Susan
Assistant Professor
susan@example.edu

Navigate to its faculty directory

Identify the directory's HTML structure & extract faculty information

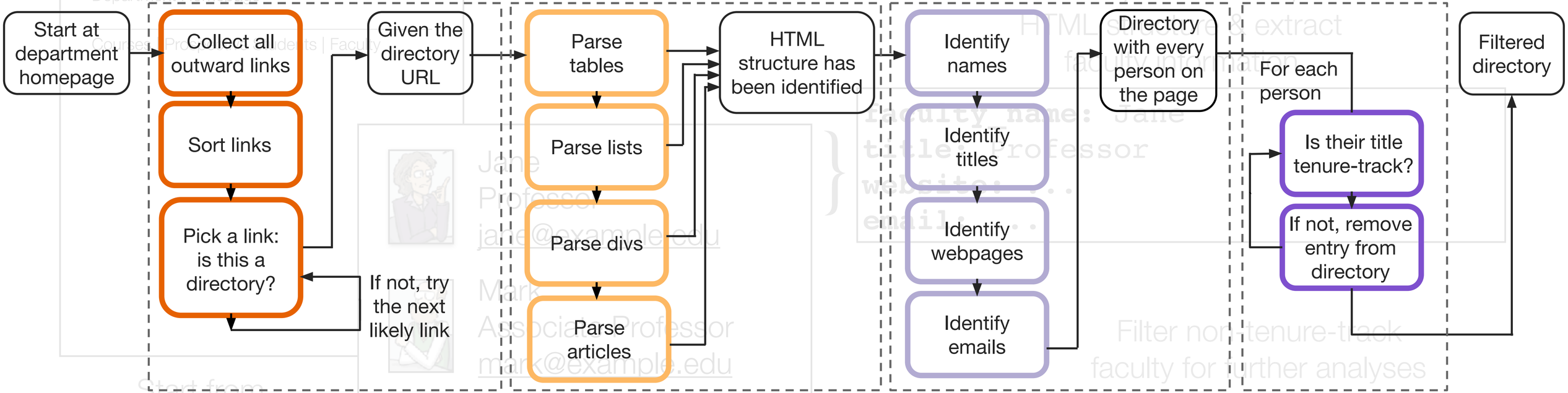
```
faculty_name: Jane
title: Professor
website: ...
email: ...
```

Filter non-tenure-track faculty for further analyses

```
title: Assistant Professor
~~title: Research Professor~~
title: Full Professor
~~title: Instructor~~
```

Cartoons by Jorge Chan; phdcomics.com

Our Approach



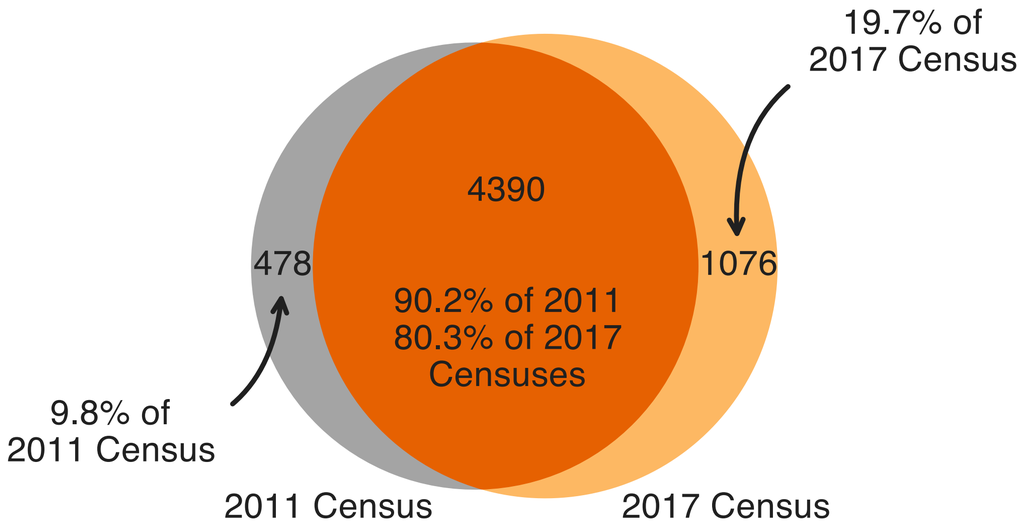
Cartoons by Jorge Chan; phdcomics.com

Engineering Results

Fast: average < 1 minute vs ~8 hours to produce a single department's faculty directory

Accurate: 99% recall (nearly all tenure-track faculty are retrieved) and precision (few non-tenure-track faculty are retrieved)

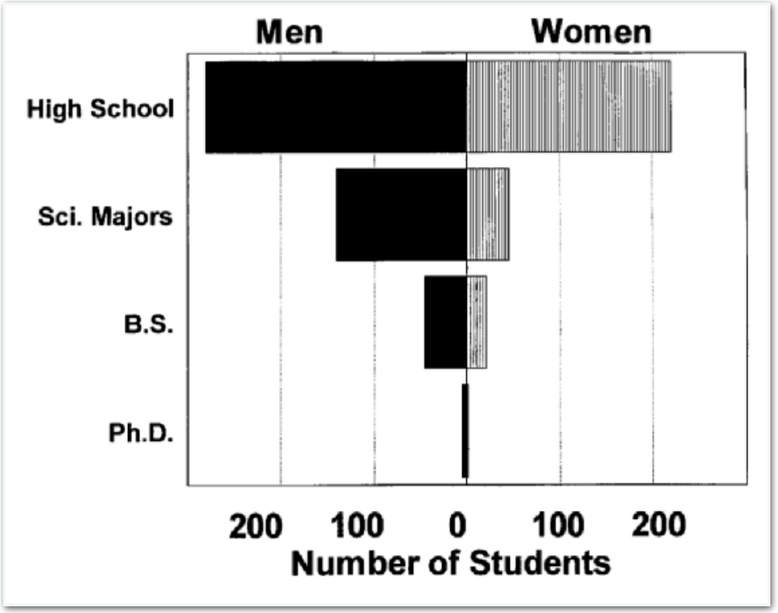
Reproduces findings of major survey organization: 12% vs 11% net growth in the number of faculty from the CRA



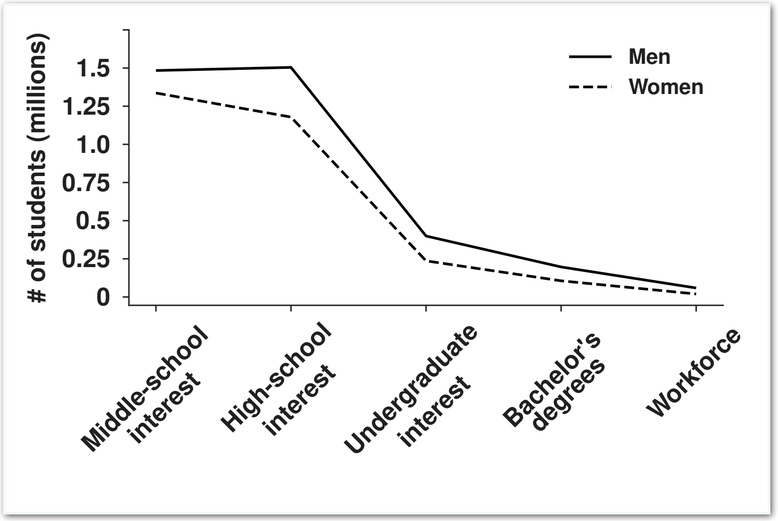
Computing Research Association: https://cra.org

So what can we do with this tool?

We investigate the **“leaky pipeline”**: women leave STEM at various career stages, resulting in their under-representation at the faculty level

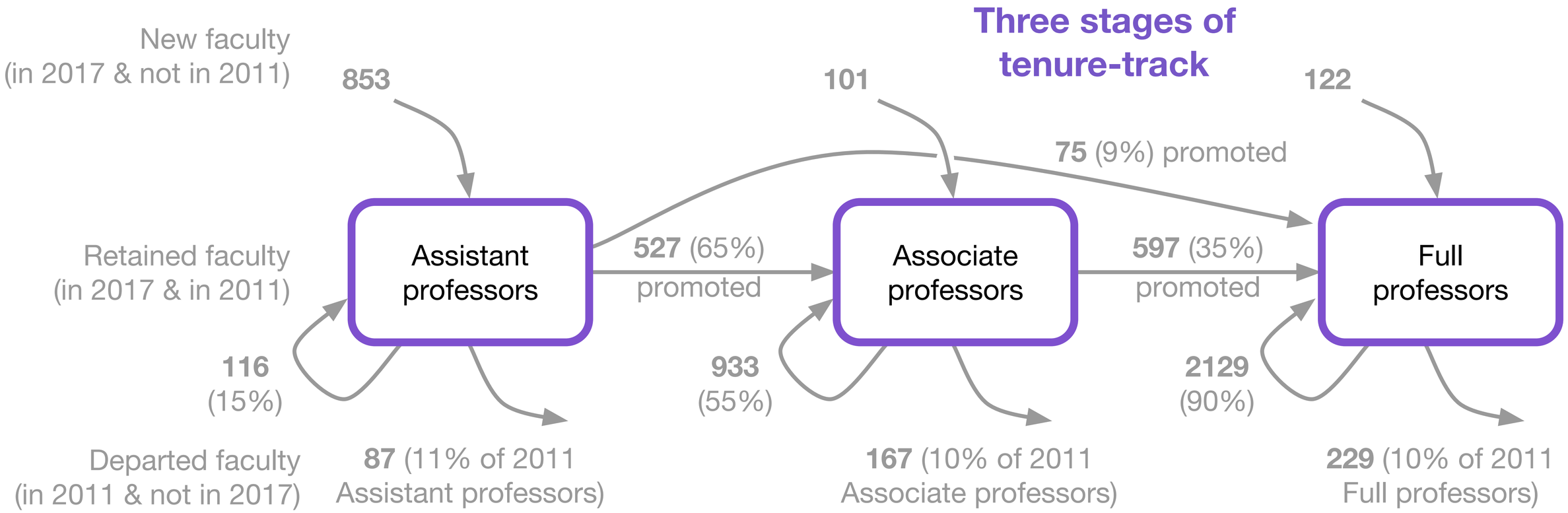


Journal of Animal Science, 74(11), 2843-2848, 1996

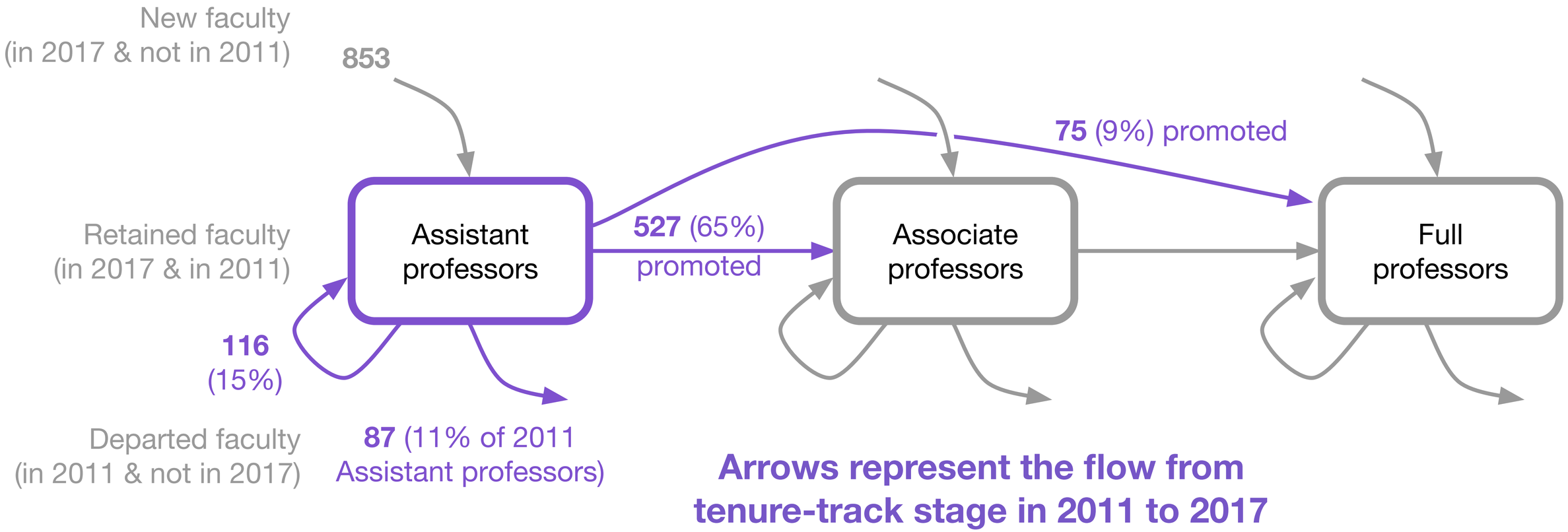


PloS ONE, *11*(7), e0157447, 2016

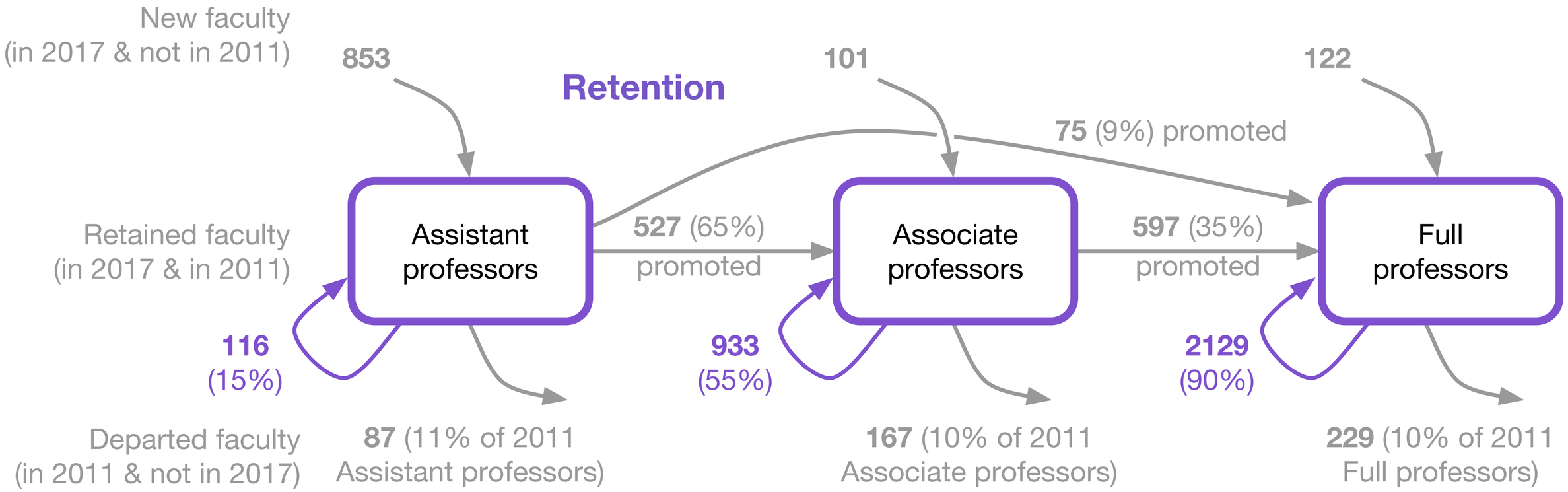
Leaky Pipeline



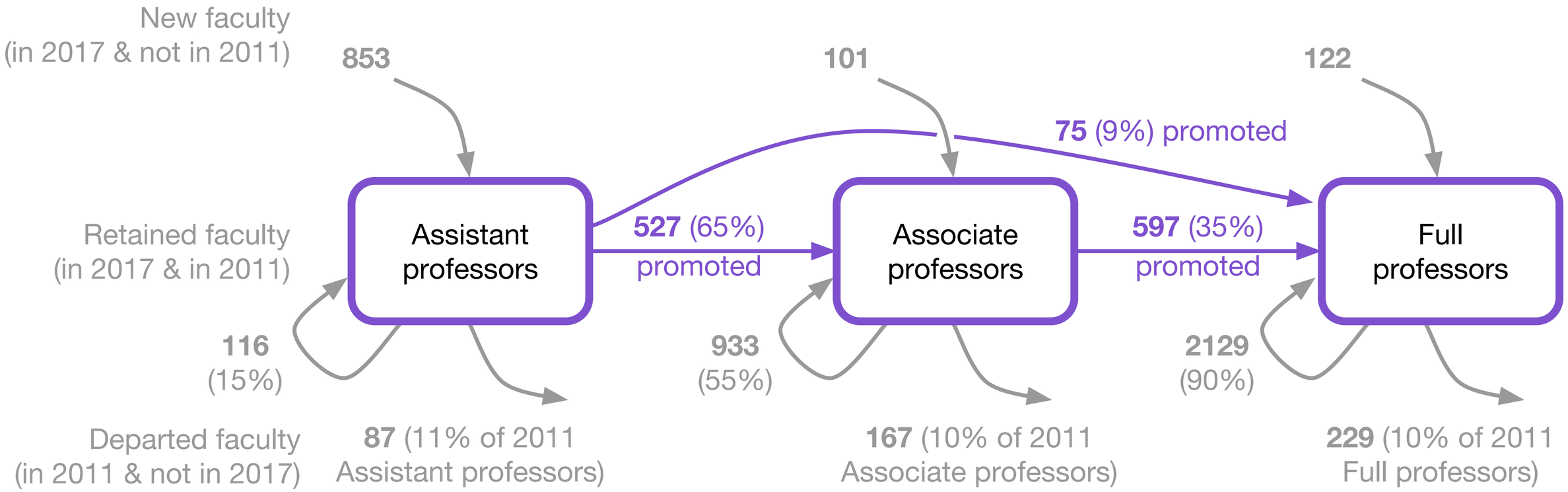
Leaky Pipeline



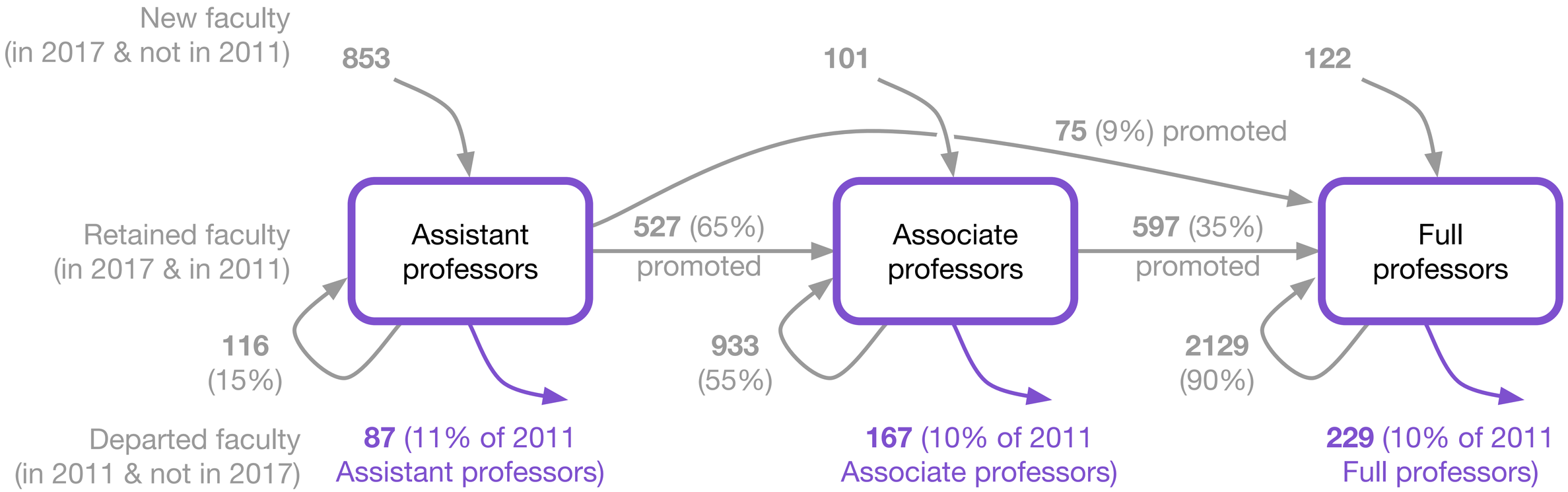
Leaky Pipeline



Leaky Pipeline



Leaky Pipeline

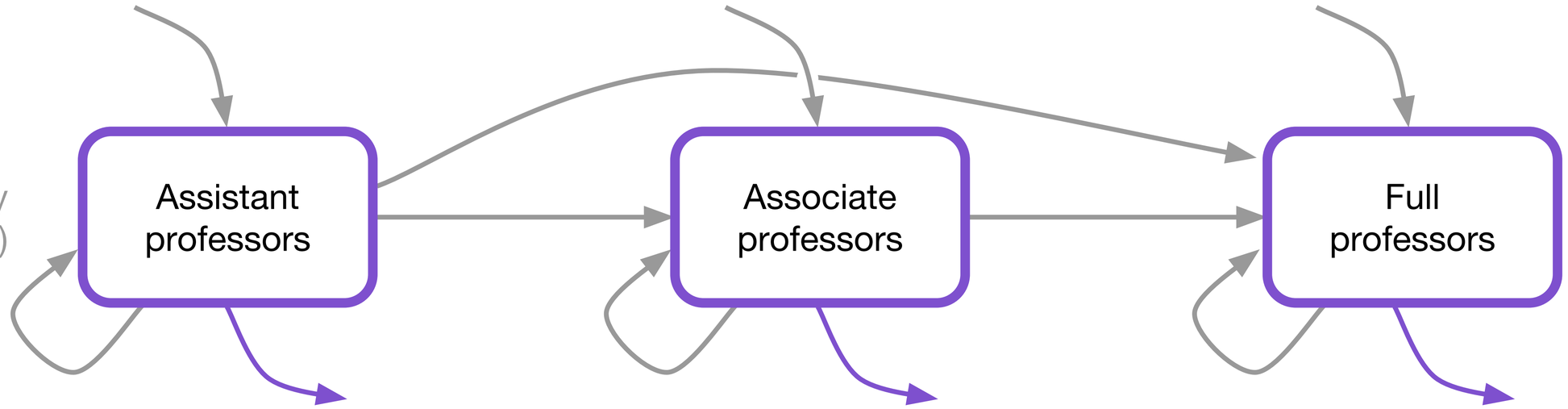


Leaky Pipeline

New faculty
(in 2017 & not in 2011)

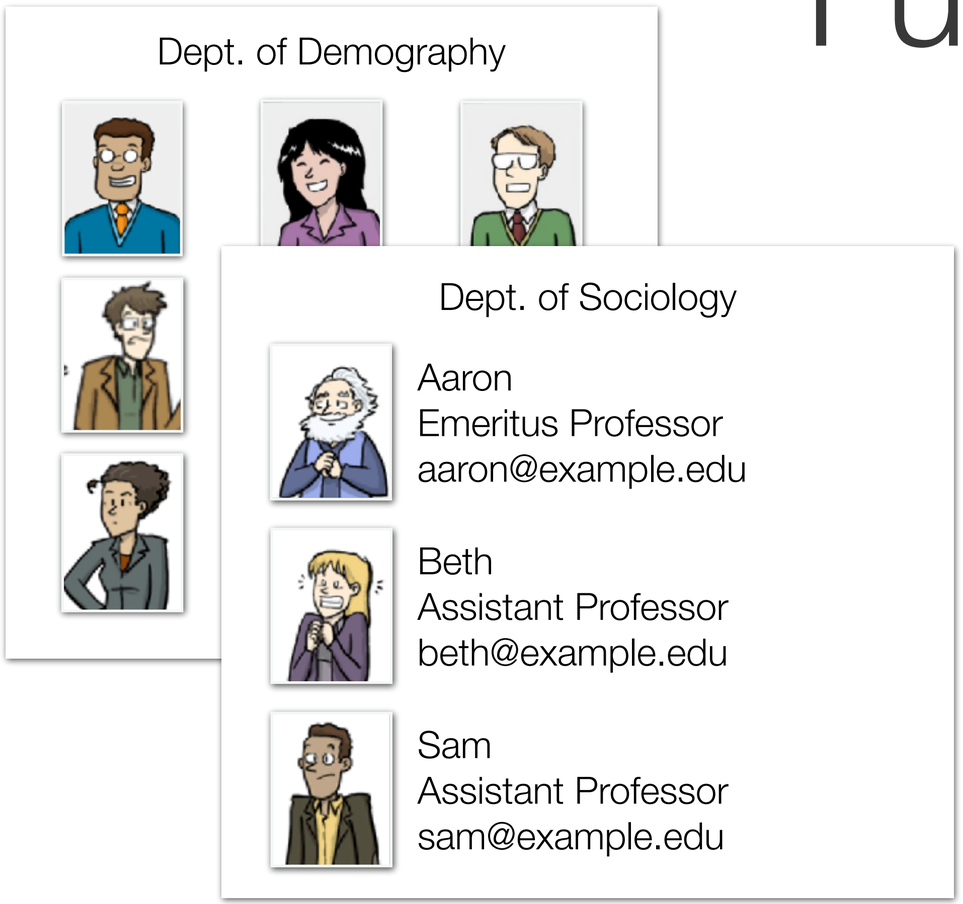
Retained faculty
(in 2017 & in 2011)

Departed faculty
(in 2011 & not in 2017)

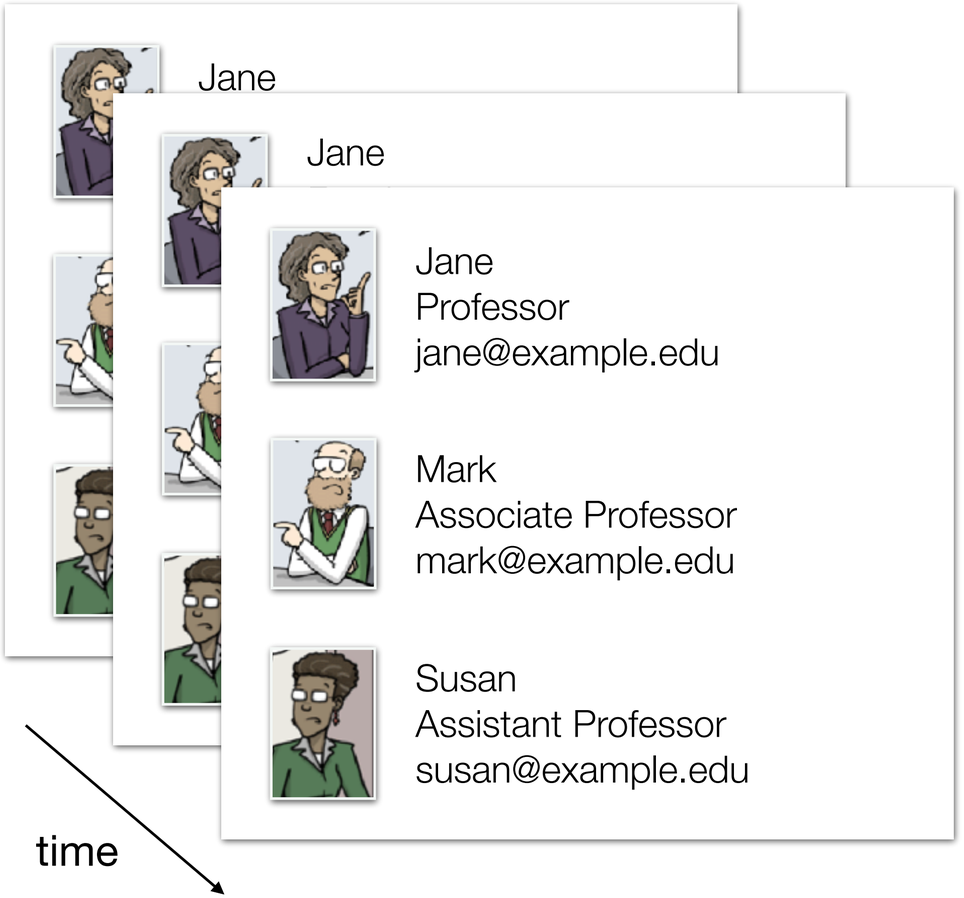


Overall attrition for women is slightly higher than men (13.7% vs 12.4%)

Future Work



Expand support to other academic fields



Use the InternetArchive to collect the historical data

Cartoons by Jorge Chan; phdcomics.com

Thanks!

Automatically assembling a full census of an academic field

Allison C. Morgan,[1,*] Samuel F. Way,[1,†] and Aaron Clauset[1,2,3,‡]

[1] *Department of Computer Science, University of Colorado, Boulder, CO, USA*
[2] *BioFrontiers Institute, University of Colorado, Boulder, CO, USA*
[3] *Santa Fe Institute, Santa Fe, NM, USA*

https://arxiv.org/abs/1804.02760

Prof. Aaron Clauset
PhD Computer Science
aaron.clauset@colorado.edu

Dr. Sam Way
PhD Computer Science
samuel.way@colorado.edu

University of Colorado **Boulder**