

# Natural experiments in online social network assembly

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# Assembling thefacebook: using heterogeneity to understand online social network assembly

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online social networks



Linkedin

General



Niche



Academia.edu  
share research

# online social networks

Defunct



friendster



tribe.net

orkut

by Google™

**online social networks**  
 **$\neq$  (offline) social networks**

online social network assembly

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- Community composition*
- Ordering effects*
- Context*
- Competition within & between systems*
- Natural limits on growth*
- Arrival (product adoption)*

## online social network assembly

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- Community composition*
- Ordering effects*
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## online social network assembly

Endogenous & exogenous  
online, offline, social, behavioral, cultural,  
structural & design-based mechanisms

# online social network assembly

What does assembly look like?

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Why is it hard to measure?

# online social network assembly

What does assembly look like?

Why is it hard to measure?

What processes are actually at play,  
supposing we could observe them?

# social search vs. social browsing

# online social network assembly

What does assembly look like?

Why is it hard to measure?

What processes are actually at play,  
supposing we could observe them?

{ offline & online  
present & historical  
implicit: endogenous & exogenous



TheFacebook

**"Classes are being skipped. Work is being ignored. Students are spending hours in front of the computer in utter fascination. Thefacebook.com craze has swept through campus."**

-- *The Stanford Daily*, 03/05/2004

**MEDIA KIT  
SPRING 2004**

# What Is thefacebook.com?

Thefacebook.com is an expanding online directory that connects students, alumni, faculty and staff through social networks at colleges and universities. This online directory allows for user connections on the basis of friendship, courses and social networks (including intra and inter-school networks), and has a built-in messaging system.

## User Profile

Each thefacebook.com user maintains and updates a profile that includes:

### 1. Contact Information

### 2. Personal Information

*relationship status and procurement, political views, clubs, jobs and favorite music, books, movies and quote*

### 3. Course Information

*the site has a built-in database of school courses and concentrations and automatically builds a user's class schedule*

### 4. Picture

Additionally, thefacebook.com automatically adds to each user profile links to school news articles that refer to the user, the last user away-message in the AIM system and the last user access location (the site has a built-in database of school dormitories and halls).

The screenshot shows a user profile for 'Eduardo Saverin' on thefacebook.com. The top navigation bar includes links for Home, Search, Courses, SocialNet, Events, Feeds, and Logout. The profile page features a large photo of two people, Eduardo and a female friend. Below the photo are sections for Connections (with a note that Eduardo is currently logged in from off-campus), Last Activity (showing he was last seen on February 10, 2006, at 22:25 UTC), and Extended Friends (listing friends like Jennifer, Dennis, and others). Other sections include Other Schools (with French #1), and a Friends section showing profiles for Indiana Russell, Leah Zimmerman, Lauren Tavares, and others. At the bottom, it says Eduardo Saverin has 154 friends.

# Our Audience – *The College Addiction*

There are 15 million college students in the United States. With an estimated purchasing power that exceeds \$85 billion, college students have money in their pockets for your services and products. This year they will spend \$21 billion on restaurants and food, \$9 billion on automobiles, \$5 billion on clothes, \$4 billion on phones and \$46 billion on other amenities. College students are also active job seekers.

## User Base Demographics\*

Total Users	70,000*
Ivy-League	55%
Other Schools	45%
Students	87%
Alumni	11%
Faculty and Staff	2%
Men	48%
Women	52%
Age 18 to 24	92%

## Site Usage\*

Daily Unique Users	65%
Monthly Unique Users	95%
Daily Traffic in Pageviews	3 million*
Monthly Traffic in Pageviews	90 million*

## Usage Growth Rate

The growth rate of the total number of users is increasing, with the addition of 10,000 thefacebook.com members in the first week of April, 2004.

The percentage of daily unique users has slightly increased through time.

The monthly traffic in pageviews has grown through time in proportion to the growth rate of the user base.

**“I have a new addiction. It is powerful. It is disturbing. It is thefacebook.com.”**

*--The Daily Pennsylvanian, 03/25/04*

\*Based on March 2004 Monthly Statistics

\*Based on April 19, 2004

# *Our Schools – The Expansion*

Thefacebook.com was launched on February 4, 2004 at Harvard University. As of April 19, 2004, the expansion of thefacebook.com network has yielded the following member schools:

## Ivy-League

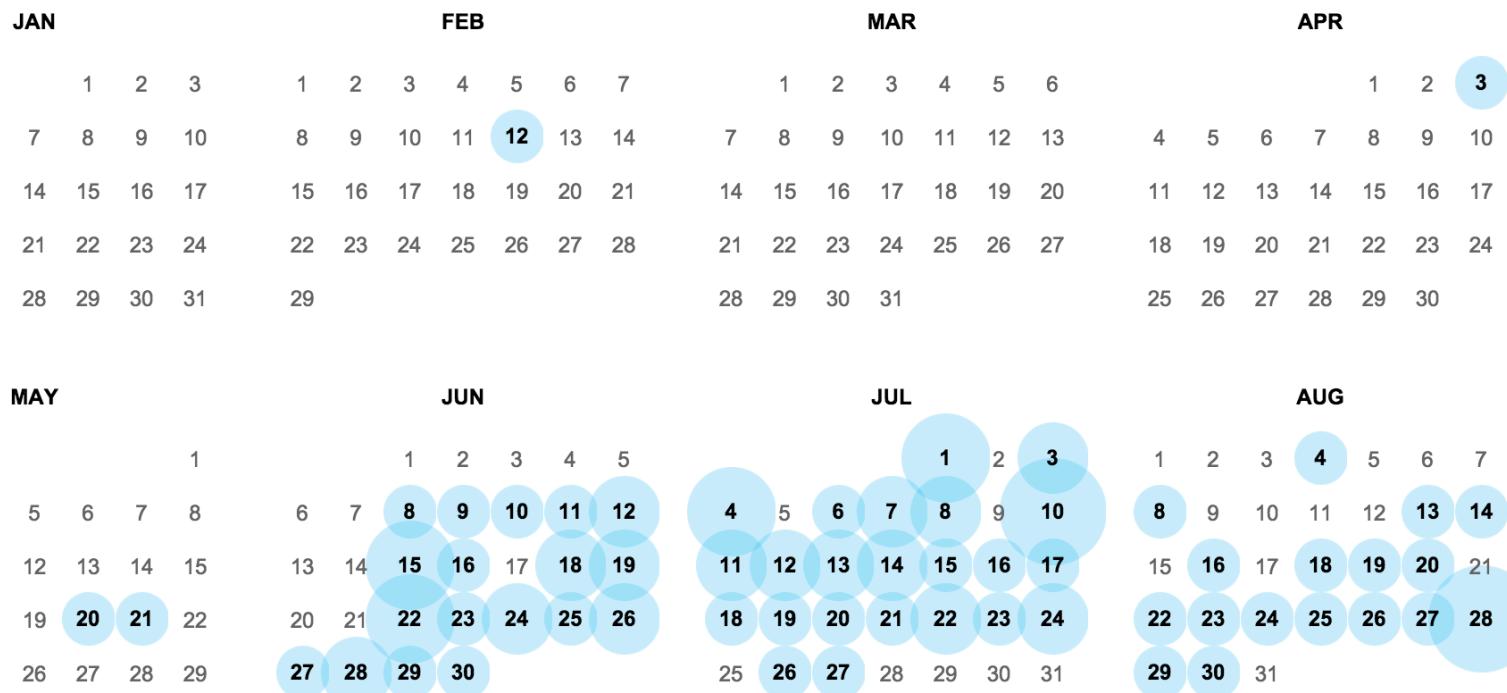
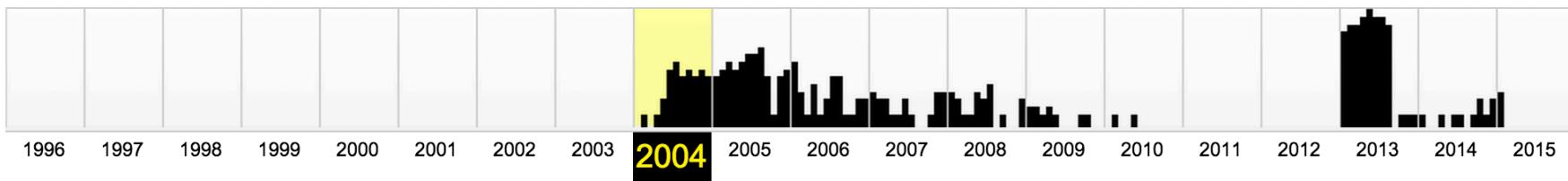
<u>Launch Date</u>	<u>Name</u>
February 4, 2004	Harvard University
February 24, 2004	Columbia University
March 1, 2004	Yale University
March 7, 2004	Dartmouth University
March 7, 2004	Cornell University
March 14, 2004	University of Pennsylvania
April 4, 2004	Brown University
April 4, 2004	Princeton University

## Other Schools

<u>Launch Date</u>	<u>Name</u>
February 26, 2004	Stanford University
March 14, 2004	MIT
March 21, 2004	New York University
March 21, 2004	Boston University
April 4, 2004	UC Berkeley
April 11, 2004	Duke University
April 11, 2004	Georgetown University
April 11, 2004	University of Virginia
April 19, 2004	Tufts University
April 19, 2004	Boston College
April 19, 2004	Northeastern University
April 19, 2004	University of Illinois

## The Expansion Plan

The mission of thefacebook.com is to expand to include most of the schools in the United States. By September 1, 2004, thefacebook.com network will have more than 200 member schools.

<http://thefacebook.com>Saved **5,568 times** between February 12, 2004 and January 27, 2015.**PLEASE DONATE TODAY.** Your generosity preserves knowledge for future generations. Thank you.



```
00000001 11 10 1000  
0000 0010 0 1  
0000 110 0 1 1100  
0000 010 010 101  
0000 001 00 01  
0000 0 01 010  
0000 1010 1 10 0
```

# [ thefacebook ]

[login](#) [register](#) [about](#)

Email:

Password:

[login](#) [register](#)

Welcome to Thefacebook!

## [ Welcome to Thefacebook ]

Thefacebook is an online directory that connects people through social networks at colleges.

We have opened up Thefacebook for popular consumption at **Harvard, Columbia, Stanford, Yale, Cornell, Dartmouth, UPenn, MIT**, and now **BU** and **NYU**.

Your facebook is limited to your own college or university.

You can use Thefacebook to:

- Search for people at your school
- Find out who is in your classes
- Look up your friends' friends
- See a visualization of your social network

To get started, click below to register. If you have already registered, you can log in.

[Register](#) [Login](#)

[about](#) [contact](#) [faq](#) [terms](#) [privacy](#)

a Mark Zuckerberg production  
Thefacebook © 2004



The Facebook expands to over 100 university networks



Facebook drops the "the"  
Facebook100 data captured

Facebook launches News Feed  
Facebook open to everyone

Friendster launches

LinkedIn launches

MySpace launches

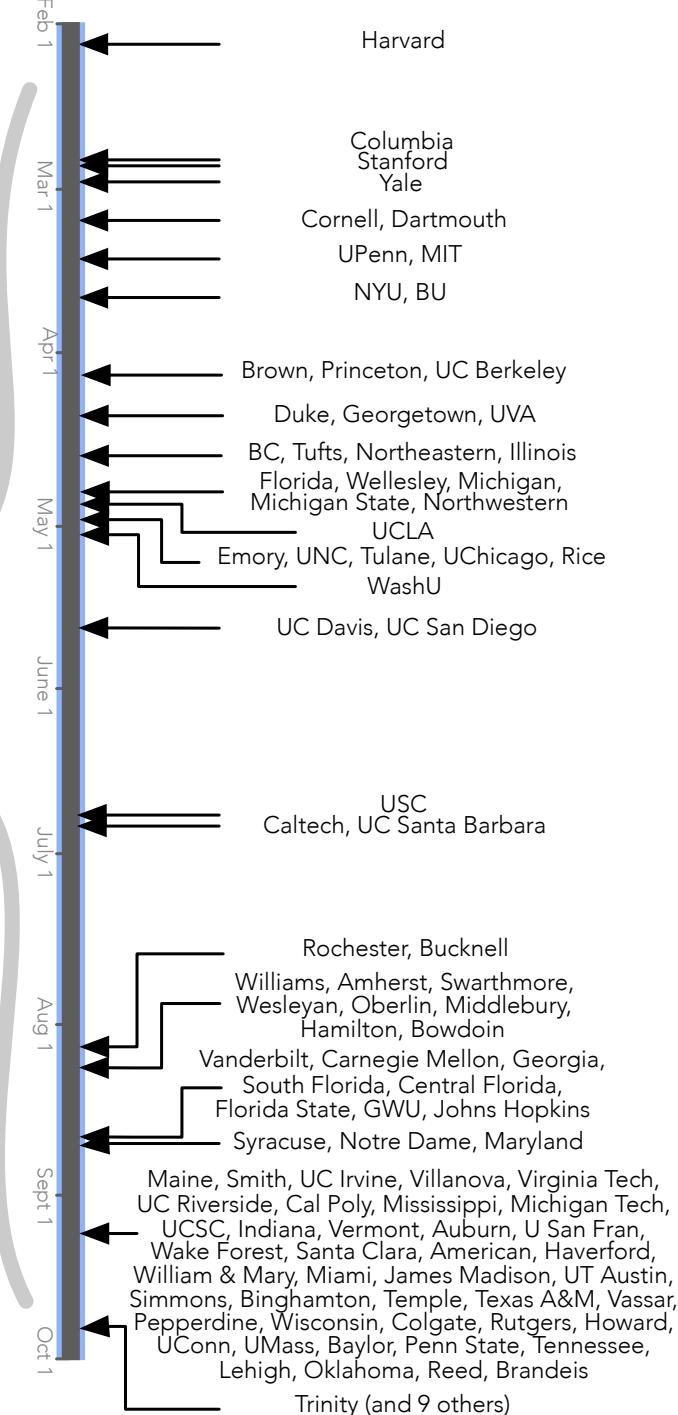
Thefacebook.com launches at Harvard

2003

2004

2005

2006



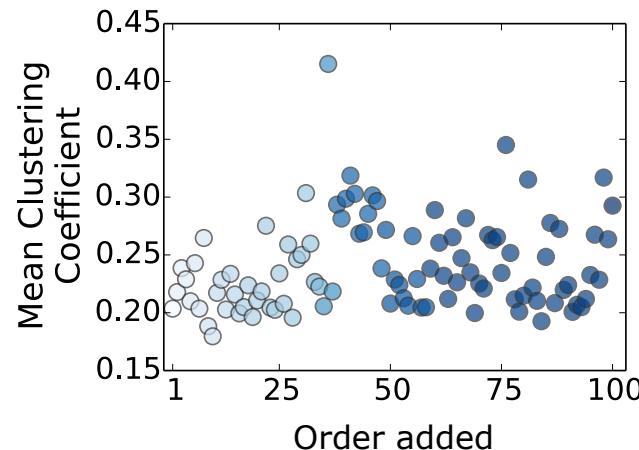
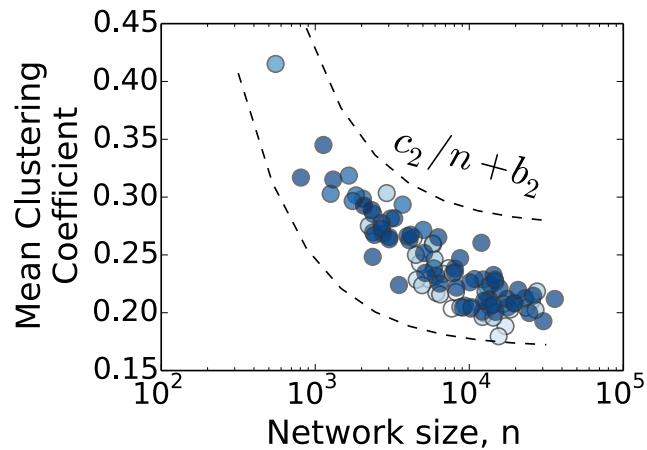
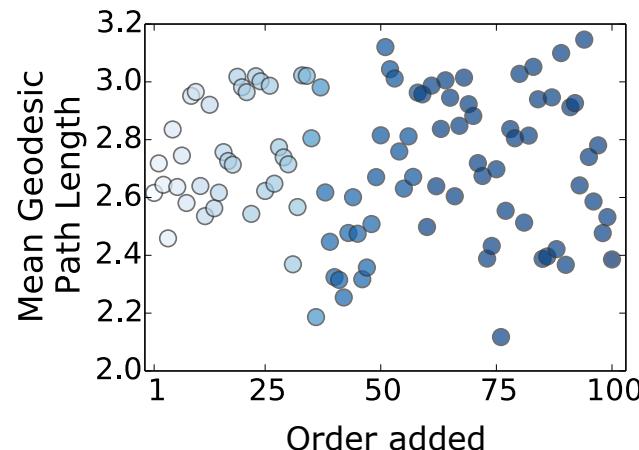
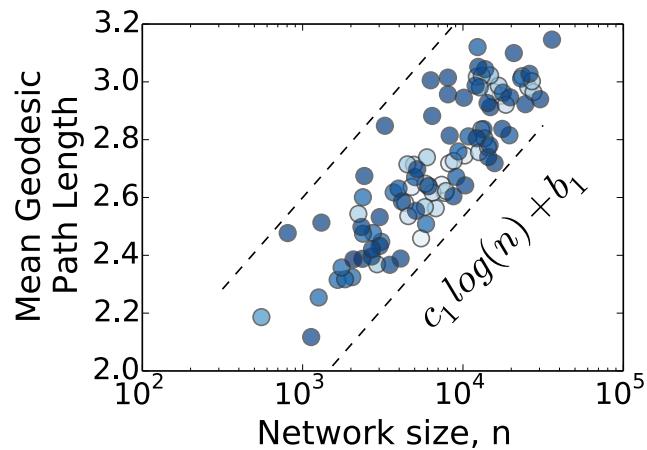
# online social network data

- Facebook100
  - 100 U.S. university networks
  - Users = 1,208,316
  - Undirected friendships = 93,969,074
  - Annotated user data:
    - Gender
    - Status (faculty/undergraduate/etc.)
    - Year of graduation
    - High school
    - Major
    - Dorm

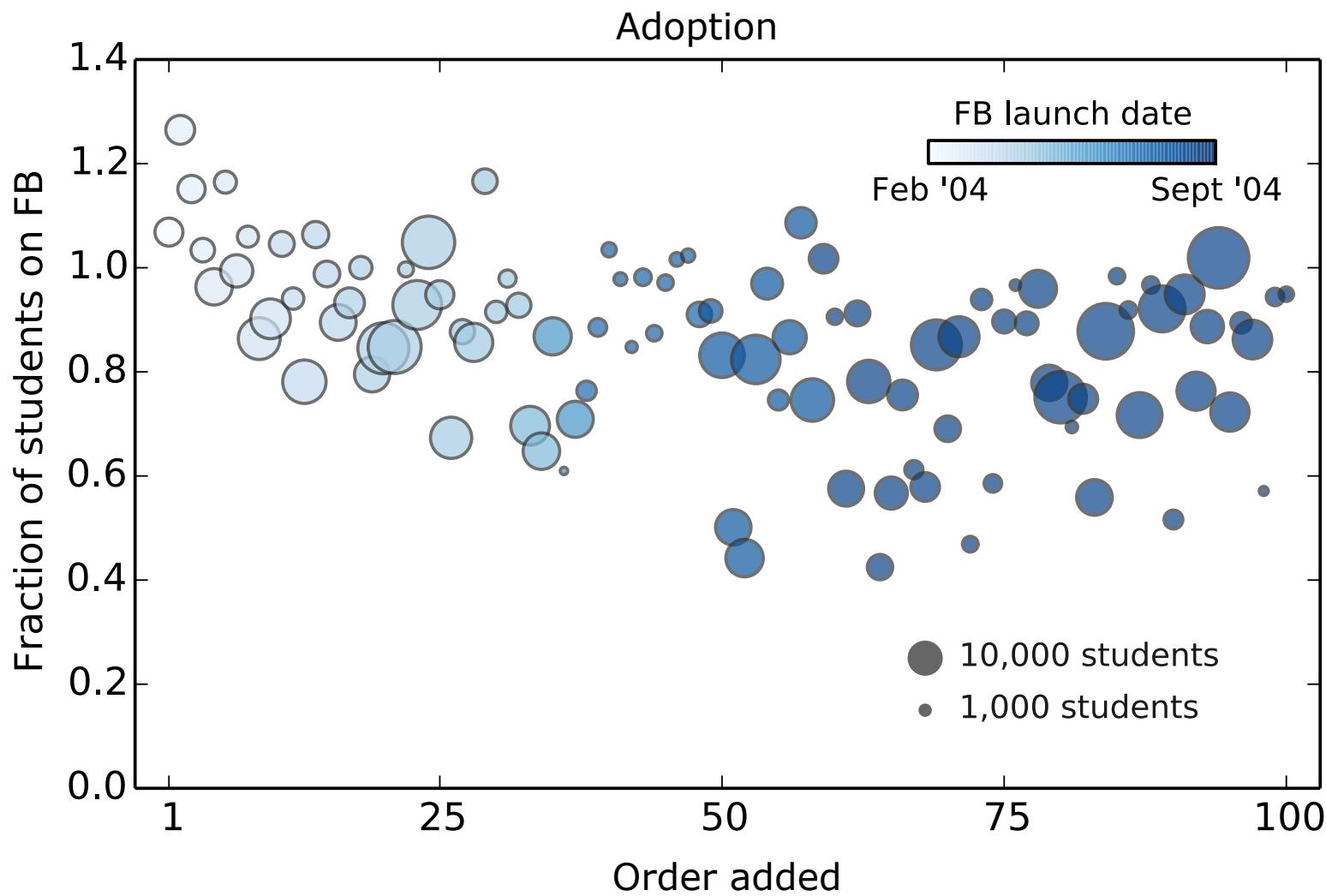
# augmented data

- Introduced:
  - Start dates
  - Graduation dates
  - Introduction of Facebook to campuses
- Estimated full-time undergraduate enrollment
  - National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education
- Within-sample surveys circa 2005 snapshot
  - demographics, social capital, self esteem and friending strategies {Ellison, Lampe, Steinfield} (2006,2007)
  - privacy, profile information & sharing Acquisti and Gross (2006)
  - social grooming & who doesn't join Facebook Tufekci (2008)
  - Facebook friending habits online & offline Mayer and Puller (2008)

# population heterogeneity in age, size mean geodesic up, clustering down

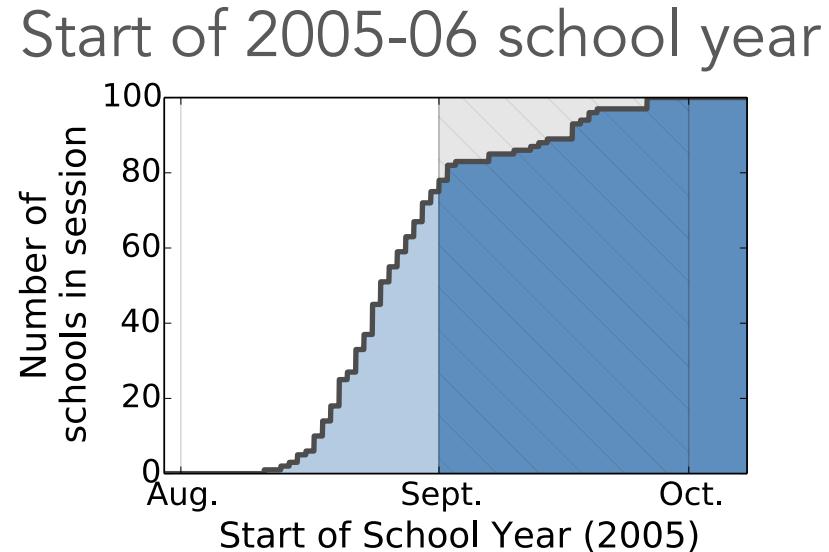
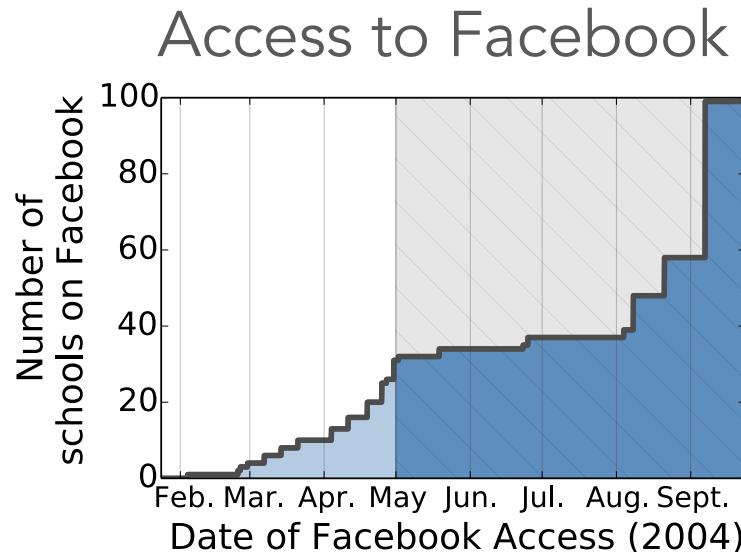


# heterogeneity in size, age, adoption



# natural experiments in network assembly

- Facebook100
  - Observed in single snapshot, early Sept 2005
  - Facebook expanded to these first 100 networks during February-September 2004

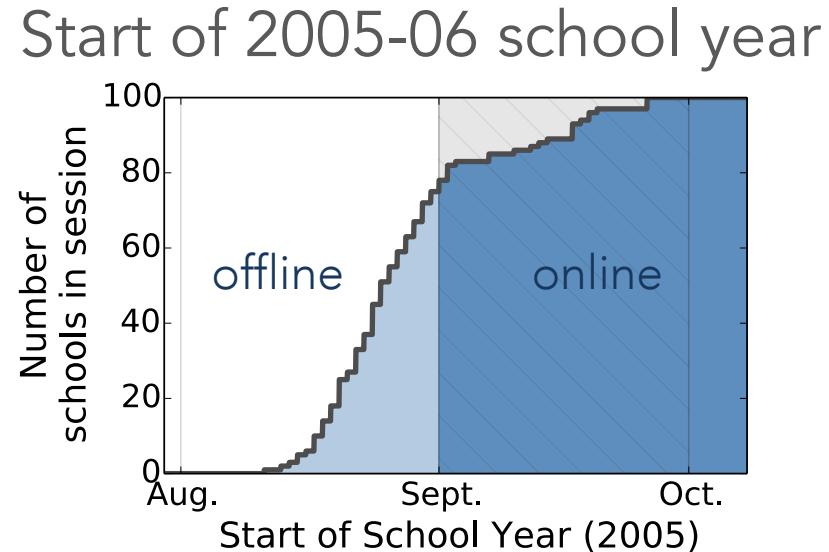
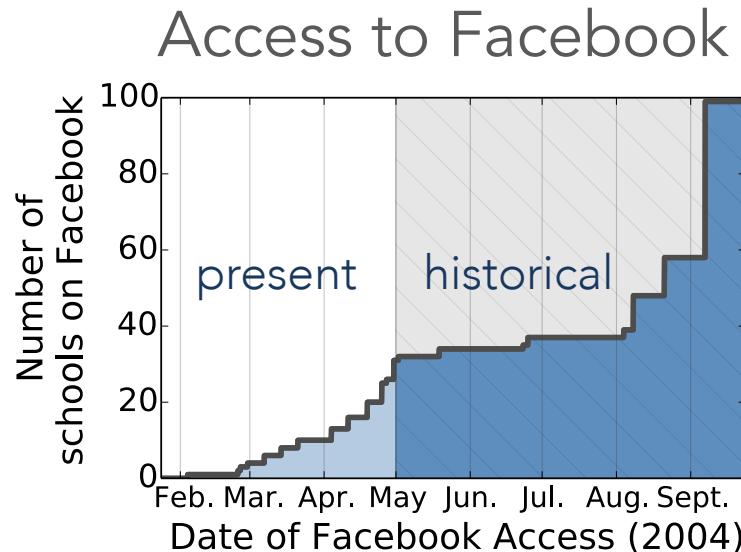


# natural experiments in network assembly

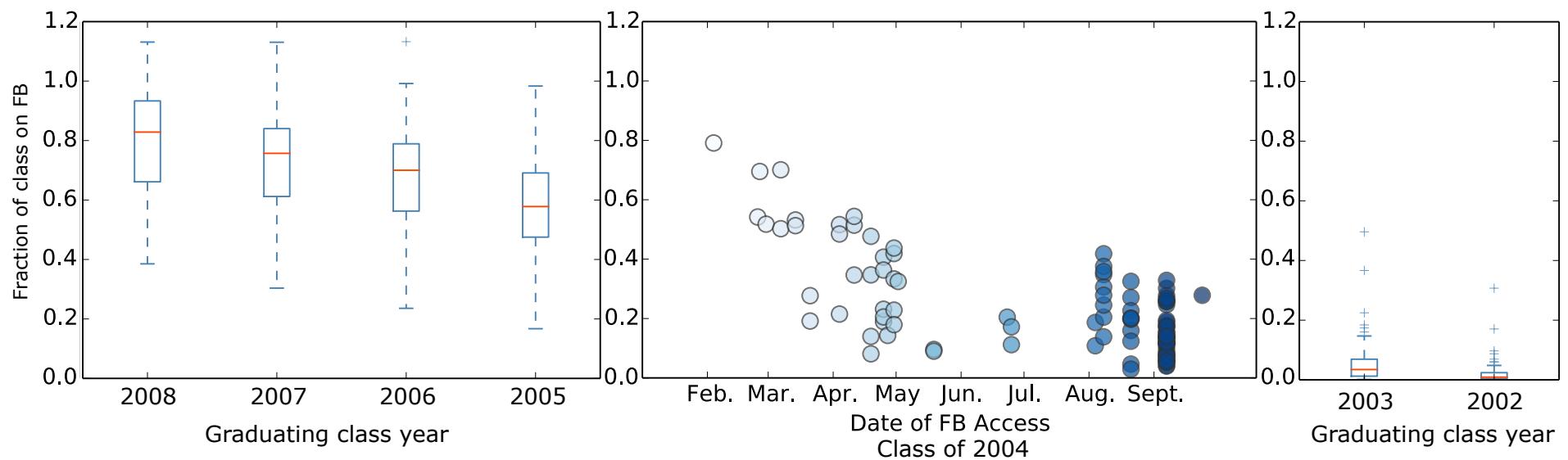
- Facebook100
    - Observed in single snapshot, early Sept 2005
    - *Facebook expanded to these first 100 networks during February-September 2004*
1. Networks are of different *vintages*
  2. Expansion spanned the end of the 2003-2004 school year [present/historical]
  3. Beginning of 2005 school year spanned the snapshot of the data [offline/online]

# natural experiments in network assembly

- Facebook100
  - Observed in single snapshot, early Sept 2005
  - Facebook expanded to these first 100 networks during February-September 2004



# adoption tracks with time on campus



++ time on campus

younger

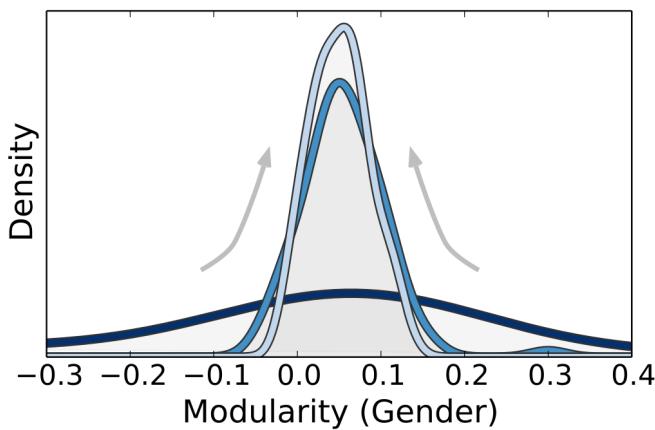
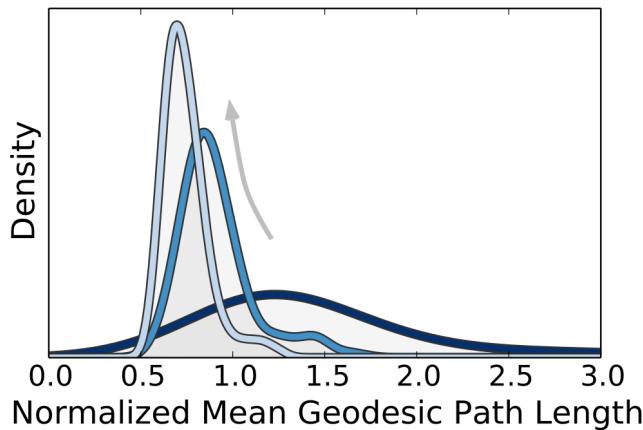
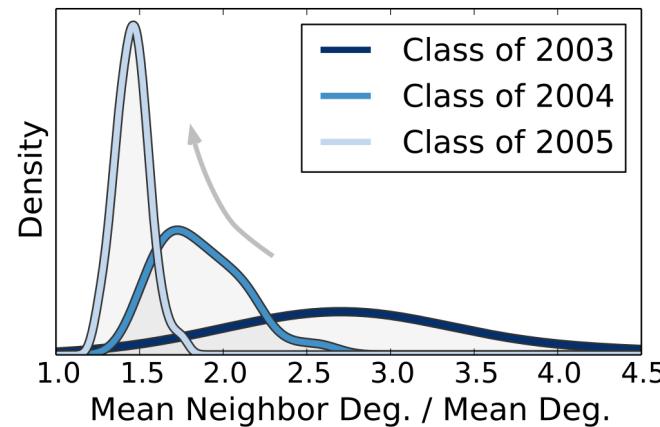
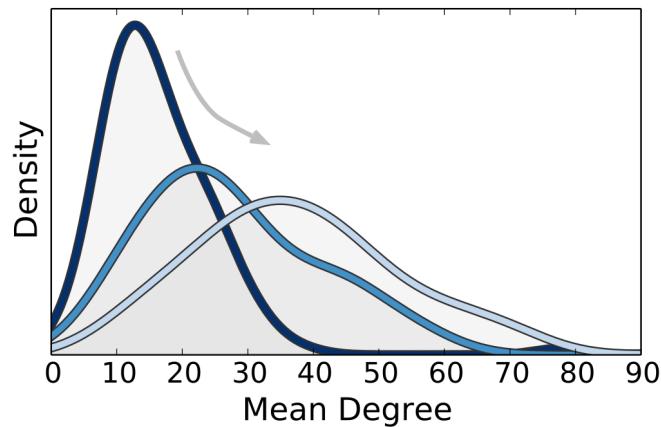
shared geography,  
present interactions

-- time on campus

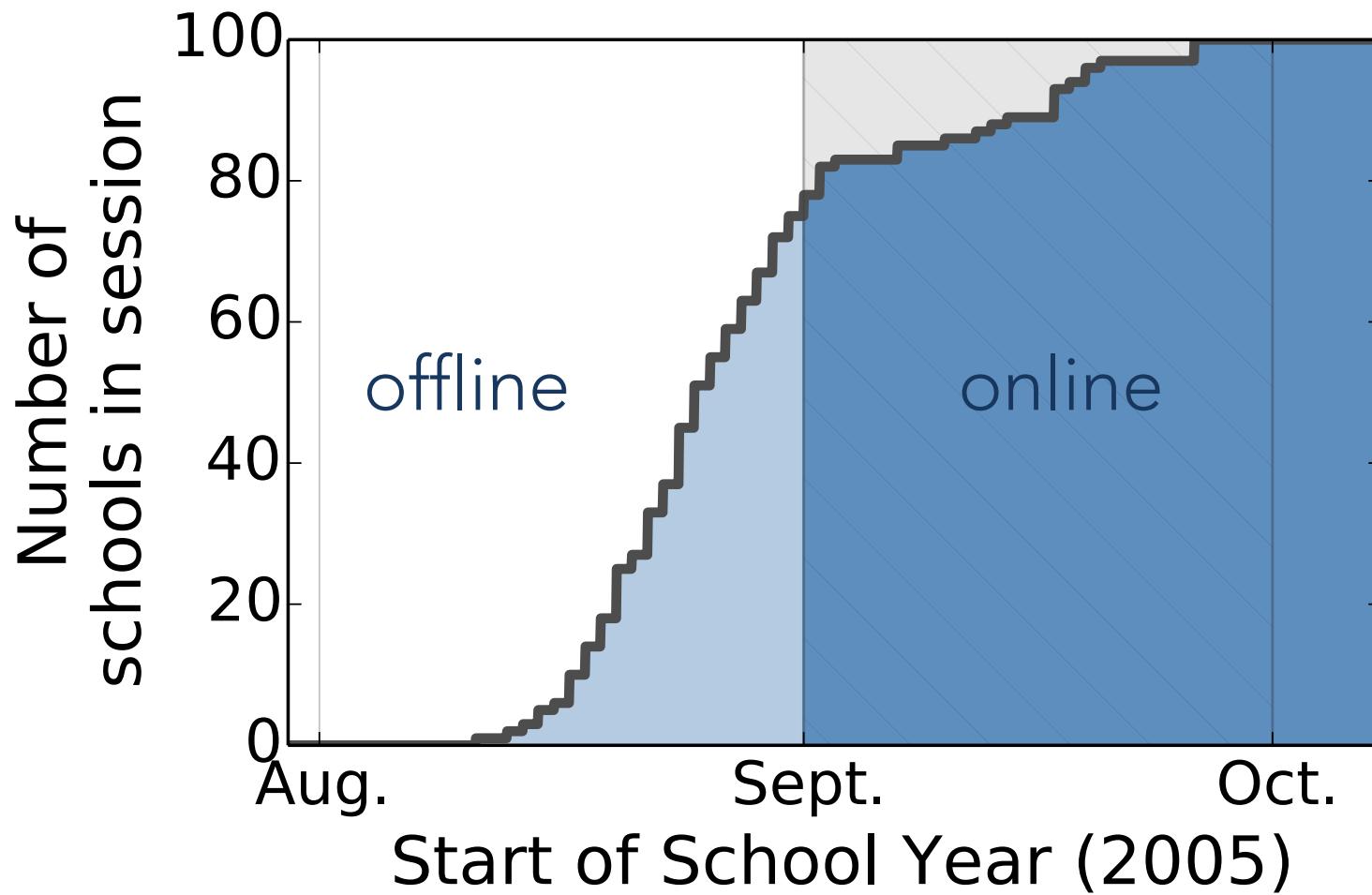
older

historical interactions

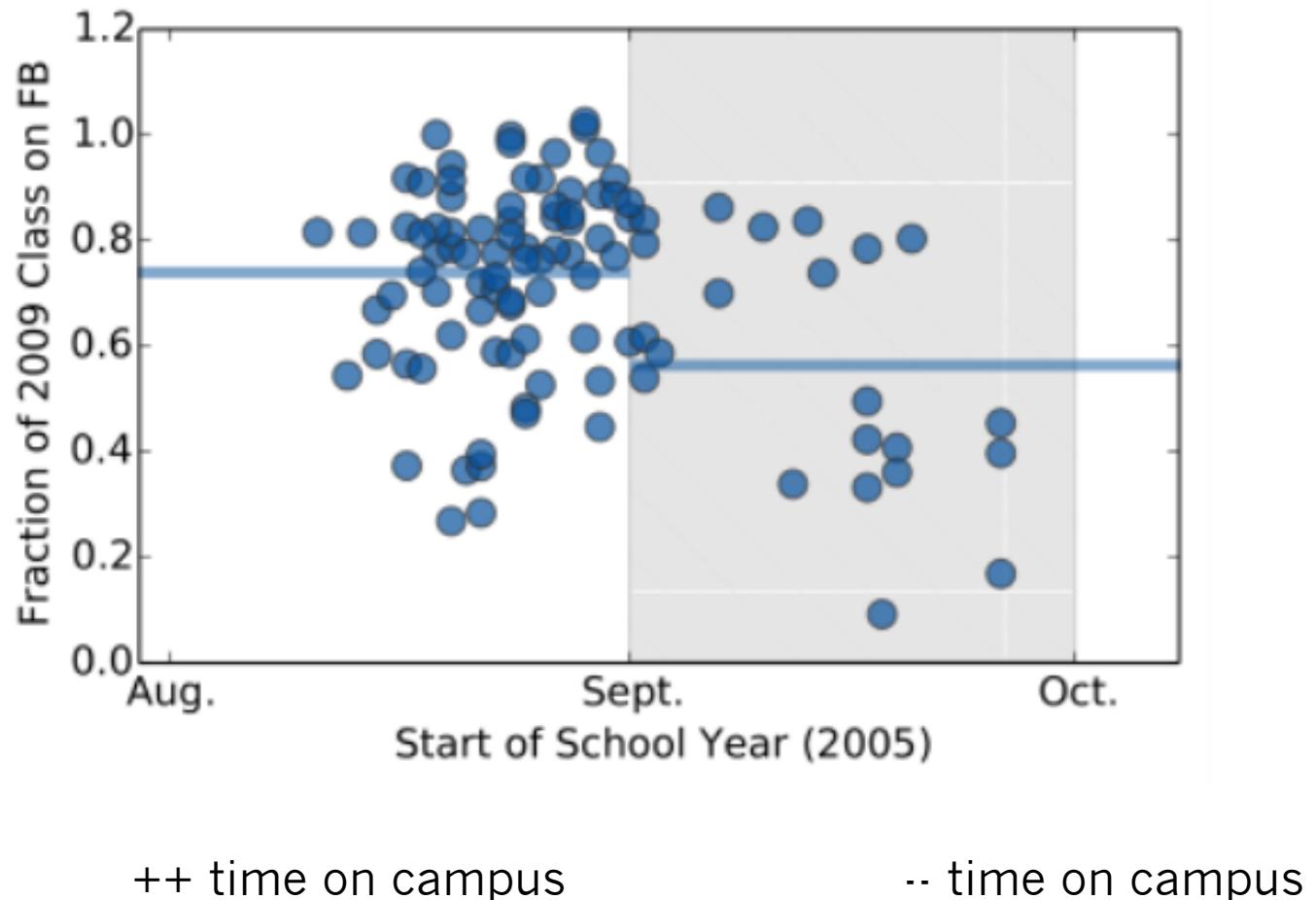
# networks matured towards similar end states

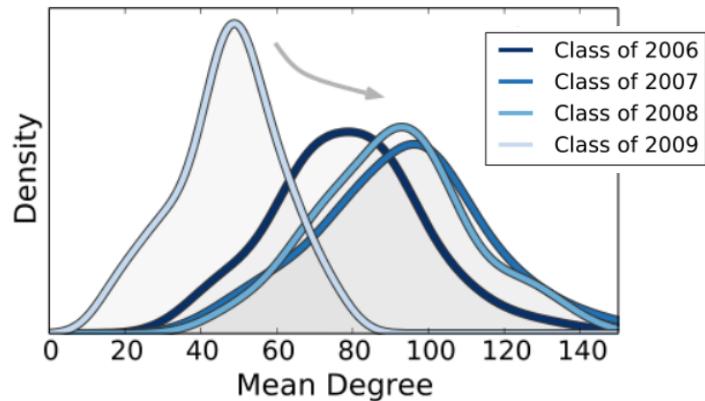


# class of 2009 natural experiment

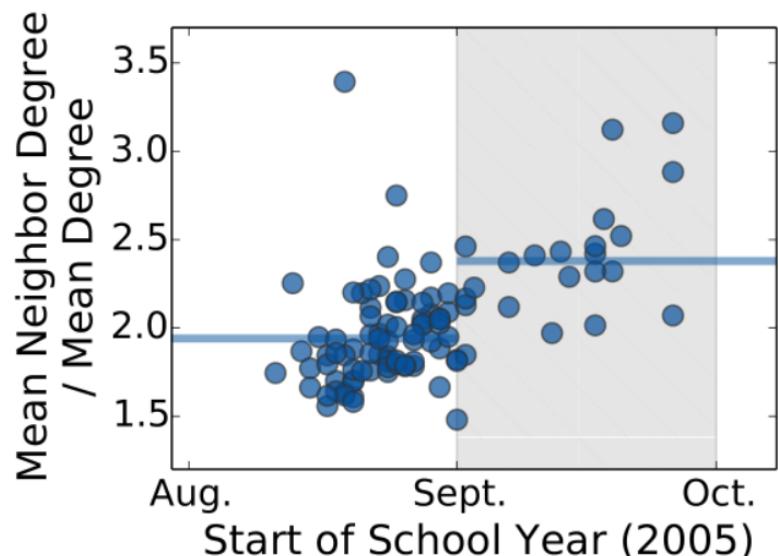
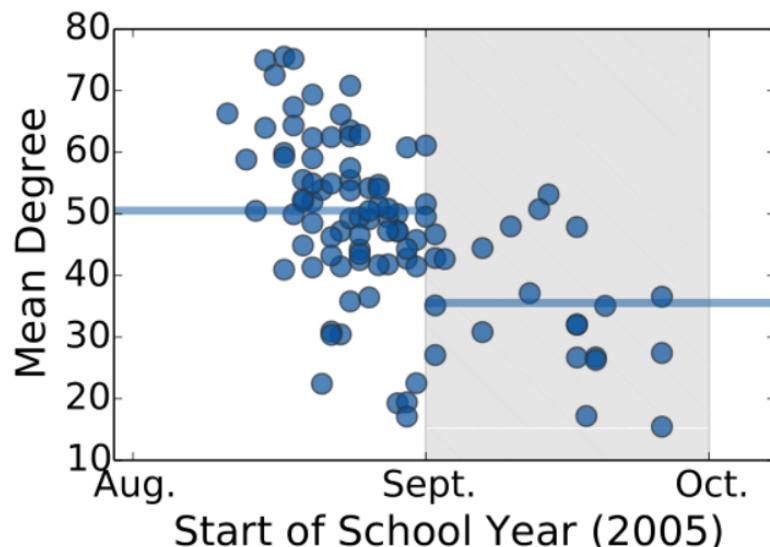


classes with more time on campus had higher adoption

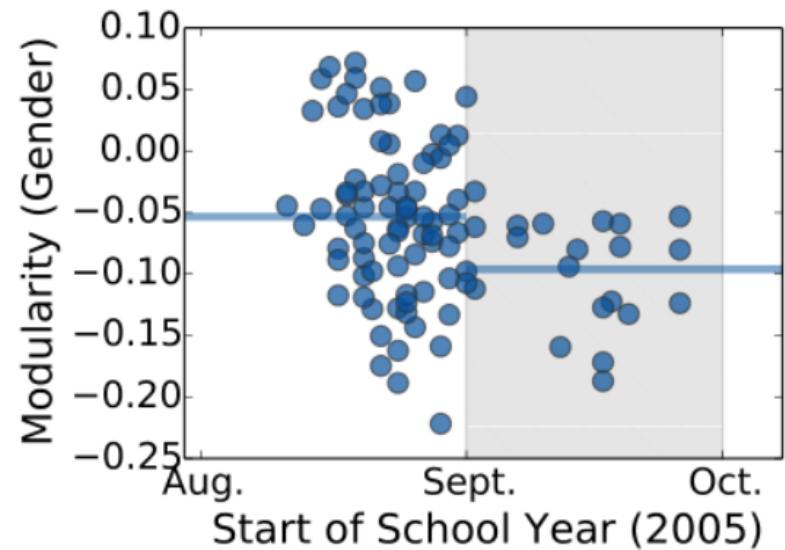
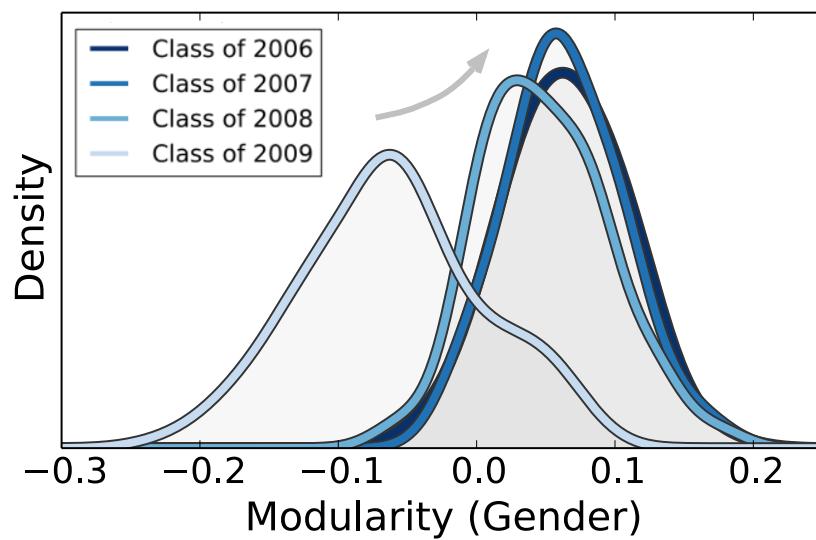




# degree distributions & social strategies change with more time on campus



degree distributions & social strategies  
change with more time on campus



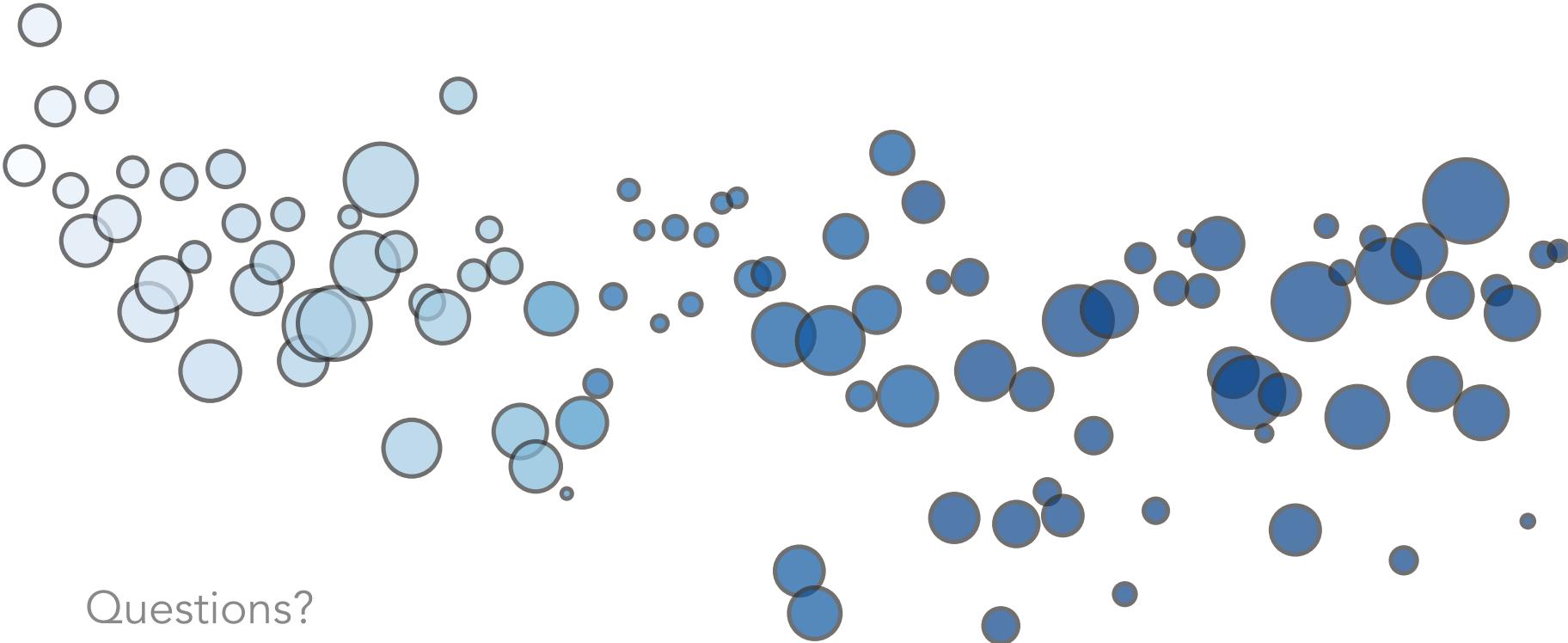
Unique timing & historical context of  
Facebook's emergence created useful  
heterogeneities

Unique timing & historical context of  
Facebook's emergence created useful  
heterogeneities

Heterogeneities (*population, treatment*) can  
reveal underlying social processes

# takeaways

- Context matters
- Assembly questions abound
  - Network maturity vs. growth, densification;  
Shortest paths follow Backstrom et al. (2012)
  - N>1
- Natural experiments reveal heterogeneities in online/offline, present/historical processes
  - Social browsing (before shared environment) vs. social search (after)
  - Shared physical environment increases adoption
  - Networks mature at different rates towards similar end states



Questions?

# THANK YOU



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Jacobs, A.Z., Way, S.F., Ugander, J. & Clauset A. "Assembling thefacebook:  
Using heterogeneity to understand online social network assembly."  
Proc. ACM WebSci (2015) arXiv:1503.06772