MOOC & SLN

Mung Chiang

Princeton University

Stanford professor resigns, launches Udacity: Free, online, university-level computer science courses

By Mercedes White, Deseret News
Published: Thursday, Feb. 2 2012 12:00 p.m. MST

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Stanford Professors Launch Coursera With $16M From Kleiner Perkins and NEA

APRIL 18, 2012 AT 2:00 AM PT

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Harvard and MIT Create EDX to Offer Massive Open Online Courses (MOOCs) Worldwide

in *Harvard, MIT, Online Courses* | May 2nd, 2012 7 Comments

The Year of the MOOC

Clockwise, from top left: an online course in circuits and electronics with an M.I.T. professor (edX); statistics, Stanford (Udacity); machine learning, Stanford (Coursera); organic chemistry, University of Illinois, Urbana (Coursera).

By LAURA PAPPANO
Published: November 2, 2012

Amherst says No to edX

Posted on May 2, 2013 ⎙ by InTheCac

San Jose State University Faculty Pushes Back Against EdX

May 3, 2013

Duke faculty pulls the plug on plan to join online consortium

Posted by **Leslie Eastman** ▪ Friday, May 3, 2013 at 11:00am

Georgia Tech To Offer Online Master's Degree For Less Than $7,000

The Huffington Post | By Tyler Kingkade 🐦 👍
Posted: 05/16/2013 1:47 pm EDT

Harvard Professors Raise Concerns over MOOCs' Threat to Higher Education

WRITTEN BY MICHELLE SHUMATE CREATED ON THURSDAY, 30 MAY 2013 13:32

July 19, 2013

San Jose State U. Puts MOOC Project With Udacity on Hold

Friday, September 6, 2013

Princeton Professor Pulls Out of MOOC

Google and edX Create a MOOC Site for the Rest of Us
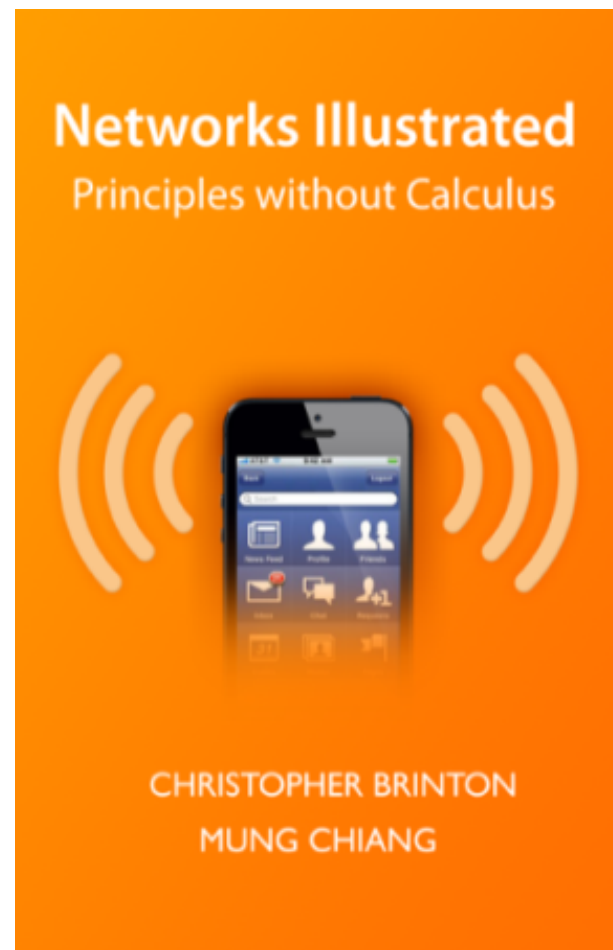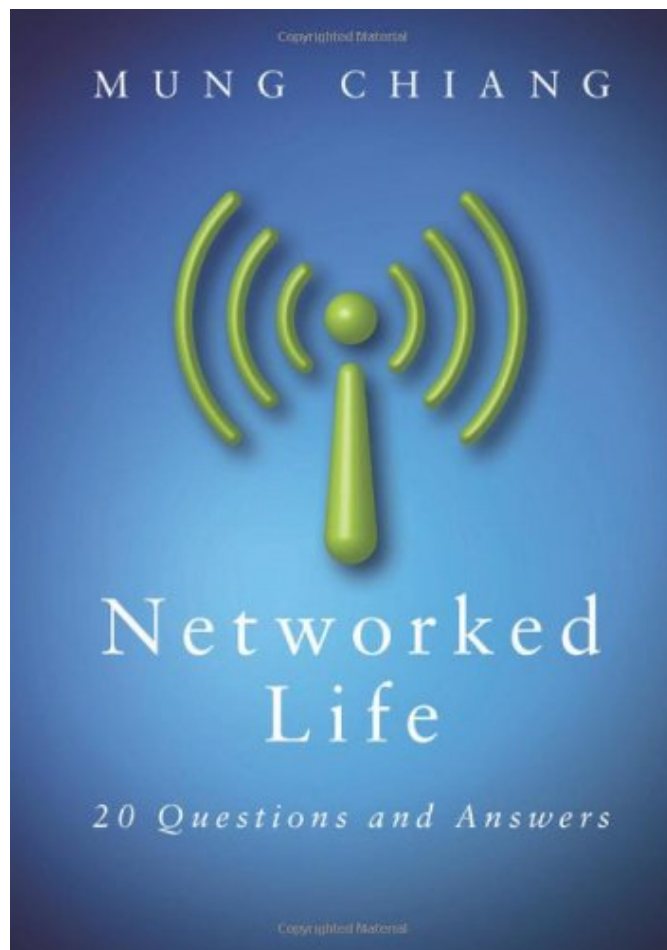
September 10, 2013, 3:28 pm

I. A Personal Journey of Learning

An Inter-disciplinary Course

Two Just-in-Time Textbooks

MUNG CHIANG

Networked Life

20 Questions and Answers

Networks Illustrated
Principles without Calculus

CHRISTOPHER BRINTON
MUNG CHIANG

Going MOOC

- One of six Princeton pilots in Sept. 2012
  - Non-exclusive arrangement with Coursera
- No credits at all
  - Tons of emails complaining about that…
- Khan Academy recording style
  - Tremendous TA help
- Kudos, VOH, GCH
- 100,000+ students enrolled so far
  - That many people who know eigenvector?

Flipping at Princeton

- Why pay tuition? Class time is for interaction
- One-way lecturing stays on YouTube.

- "I don't know what I'm talking about"
  - Better teacher on campus.
- "Same 3-hand"
  - Better student on campus?
- "Did you actually watch the video?"
  - Where is the new spine of synchronous learning?

Policy

- What counts as teaching outside?
- What counts as publishing?
- Who owns IP?
- What counts as class time credit?
- How about teacher-signed certificate?

- Why are we even in MOOC?
  - PCAST, Trustee/President, Alumni, Faculty, Staff, Students, Potential students

II. Many Dimensions of MOOC

There's More Than 1 MOOC

- Content provider vs. Platform provider
- Content aggregation vs. Content creation
- Open source platform vs. closed
- Nonprofit vs. For profit
- Degree, credits, certificate, nothing

Many Types of MOOC

Consumer/Producer	Institutions	Individual Teachers	Individual Non-teachers
Institutions	Needs accreditation	Georgia Tech/ Udacity	Difficult to achieve
Individuals	Coursera	Udacity	"Fancy" publishing

Goals/Ages	K12	College	Graduate & Professional	Lifelong Learning
Accelerate degree	*	*		
Get/switch jobs		*	*	
General education	*	*	*	*
Fun				*

1. Broad Access and Reduce Cost
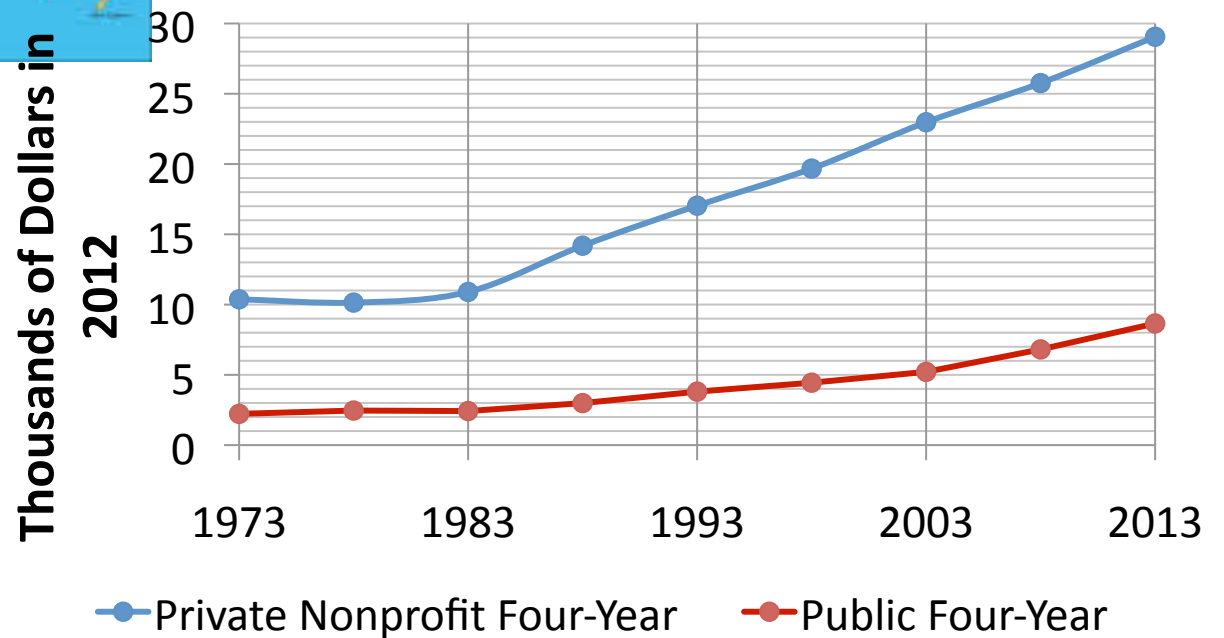
2. Roles of University/Faculty

- **What's the physical campus of a university for?**
  - A. Drinking at party
  - B. Social club initiation
  - C. Sanity check before branded stamp
  - D. Face to face learning experience
- So, how much can you charge for the service?

- **What about students who didn't dare to apply?**

3. Economics

- Revenue (not working out yet)
  - Eyeballs (e.g., advertising)
  - Content (e.g., freemium package)
  - Certificate (e.g., proctored exams)
  - Data (e.g., employment matching)

- Cost
  - Production
  - Hosting
  - Labor by teaching staff: one-time and recurrent
  - Opportunity cost

4. Policy

- Authentication
  - Are you who you say you are?
- Assessment
  - Self-grade
  - Peer-grade
  - Machine-grade
  - Expert-grade
- Accreditation
  - Who approves?
  - Who cares?

5. (Most Importantly) Pedagogy

- New science of learning
  - Distance
  - Asynchronous

  - Heterogeneous
  - Massive
  - Low (average) engagement

III. Scale

This Isn't the First Attempt

| Year	Name	Technology	Description
1892	Correspondence Learning	Postal mail	University of Chicago created first college-level distance learning program
1921	Educational Radio Licenses	Radio	FCC began granting educational radio licenses to colleges, allowing education delivery through live radio shows
1963	IFTS	TV	FCC created Instructional Television Fixed Service (ITFS), allowing broadcast of courses over TV
1970	Coastline Community College		First college without physical campus, courses mainly broadcasted on TV
1985	National Technological University	Satellite	Online degree courses via satellite transmission; students could call in and participate in discussions
1993	Jones International University	Internet	First accredited, fully online university
2002	MIT's OpenCourseWare		Free, open, web-based publication of MIT course materials
2005	Blackboard		Blackboard and WebCT merge to become a leading LMS
2007	Kahn Academy iTunes U		Non-profit educational site offering video lectures to anyone
2008	MOOC		Canadian universities
2011	100K MOOC		Udacity, edX, Coursera…

One Core Challenge

- Is 2013 the year for teaching and learning to become a scalable human activity?

    - Is technology ready? (Pretty much)
    - Is pedagogy ready? (Not yet)
    - Are business models ready? (Not yet)
    - Are teachers and students ready? (Not yet)
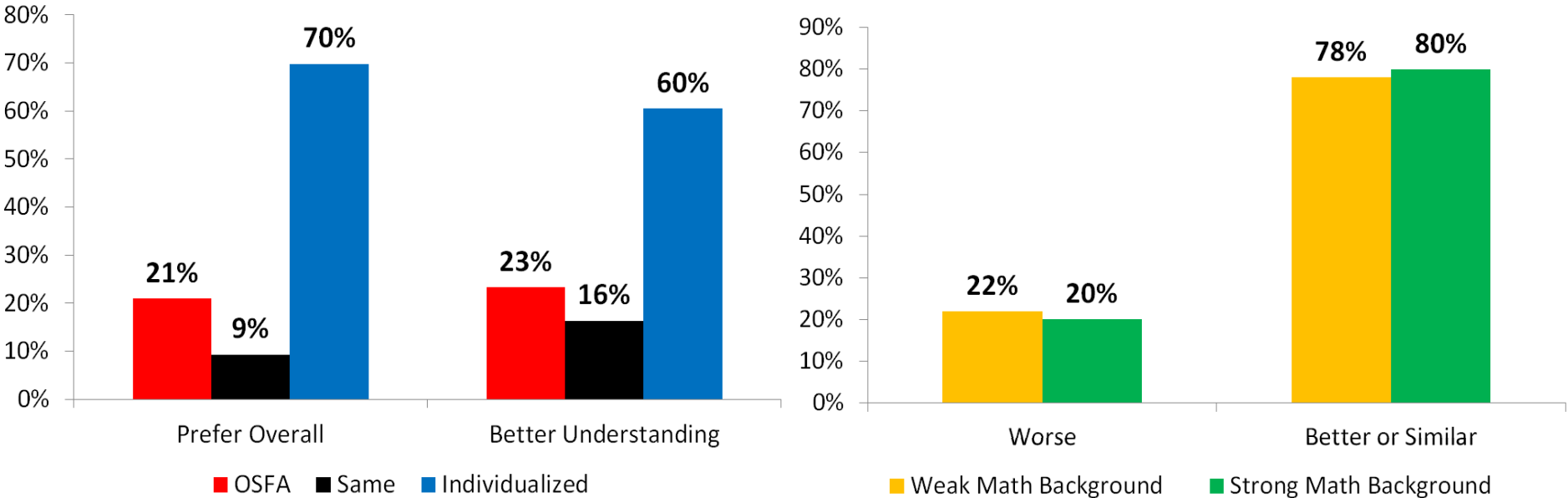
Scale – Efficacy Tradeoff

Data from http://www.katyjordan.com/MOOCproject.html
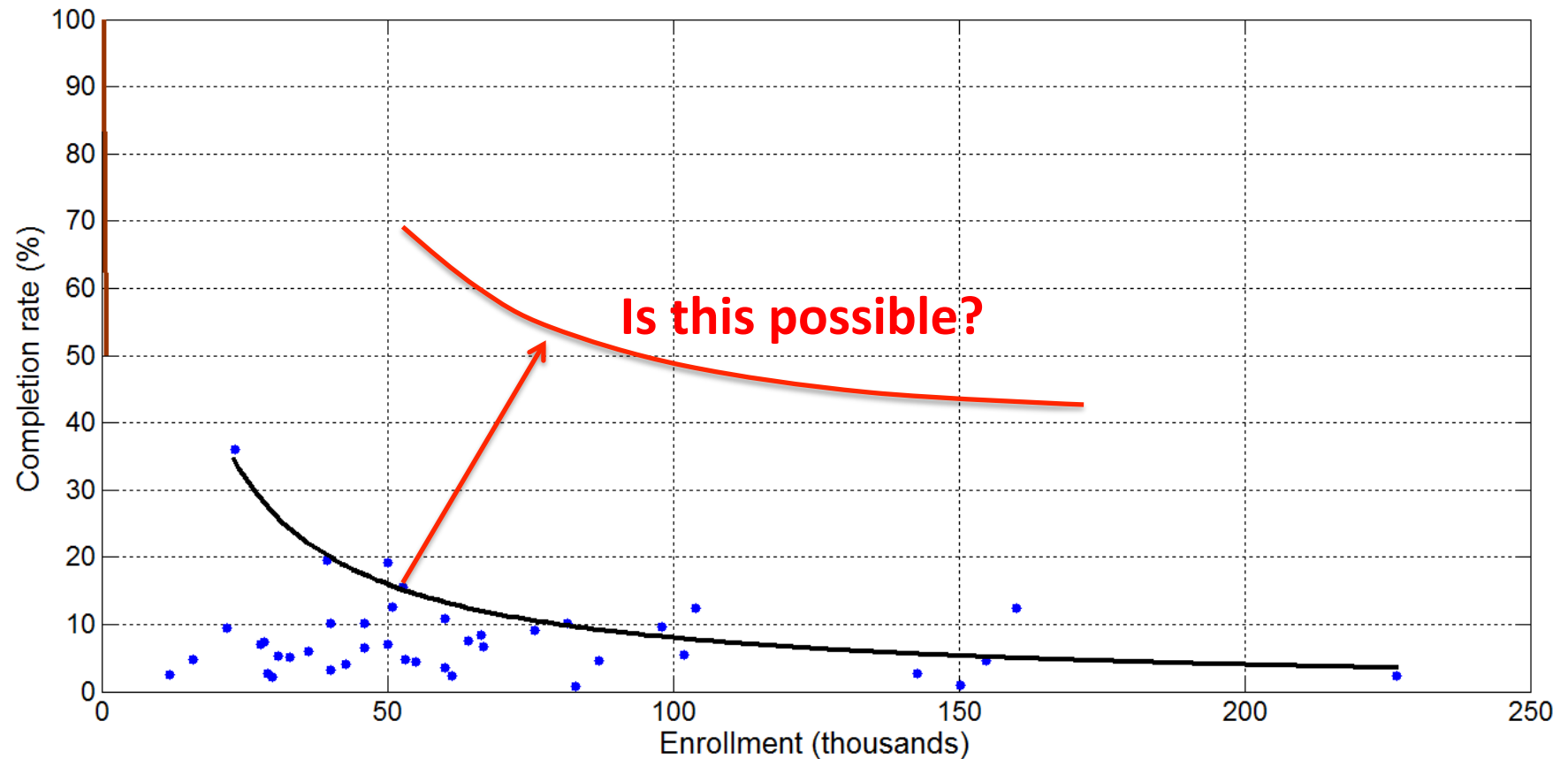
Scale Up: Social Learning
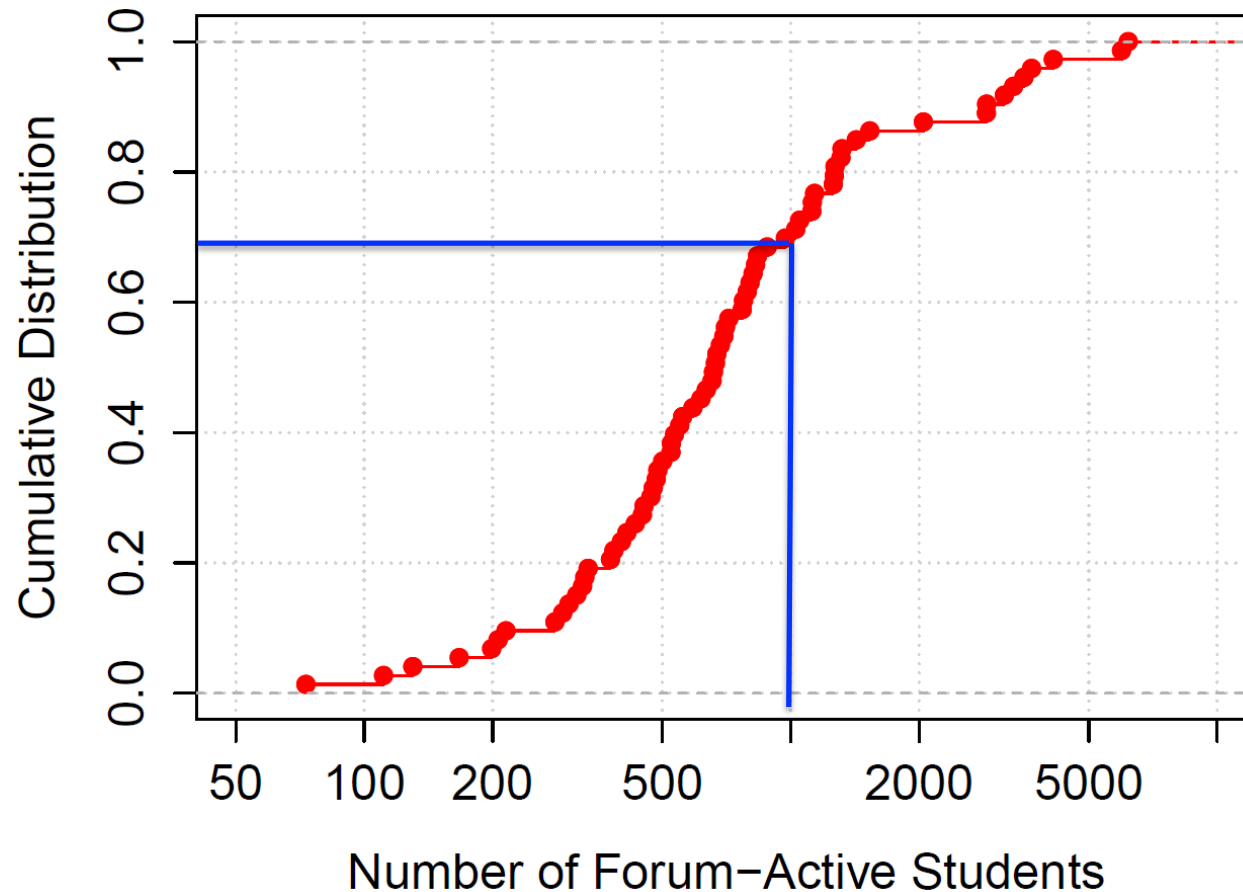
Only 30% of Coursera courses have 1000+ forum-active students

Scale Down: Individualization

Individualization shows promise over One-Size-Fits-All (OSFA)

Data about Learning

- (massive amount of) Data is
  - Common bridge across disciplines
  - Essential foundation to analytics
  - Major (potential) revenue source

- Open access to data presents:
  - Legal issues
  - Business issues
  - A key uncertainty today

What is "Open"?

- Open content consumption
- Open content creation?
- Open content packaging?
- Open policy-setting?
- Open platform?
- Open data?

Science of Learning Research

- Metrics of efficacy
- Design of experiment

- Personalize
- Incentivize
- Social learning networks

- Model of learning
- Taxonomy/structure of knowledge (MOOE)

Social Learning Networks (SLN)
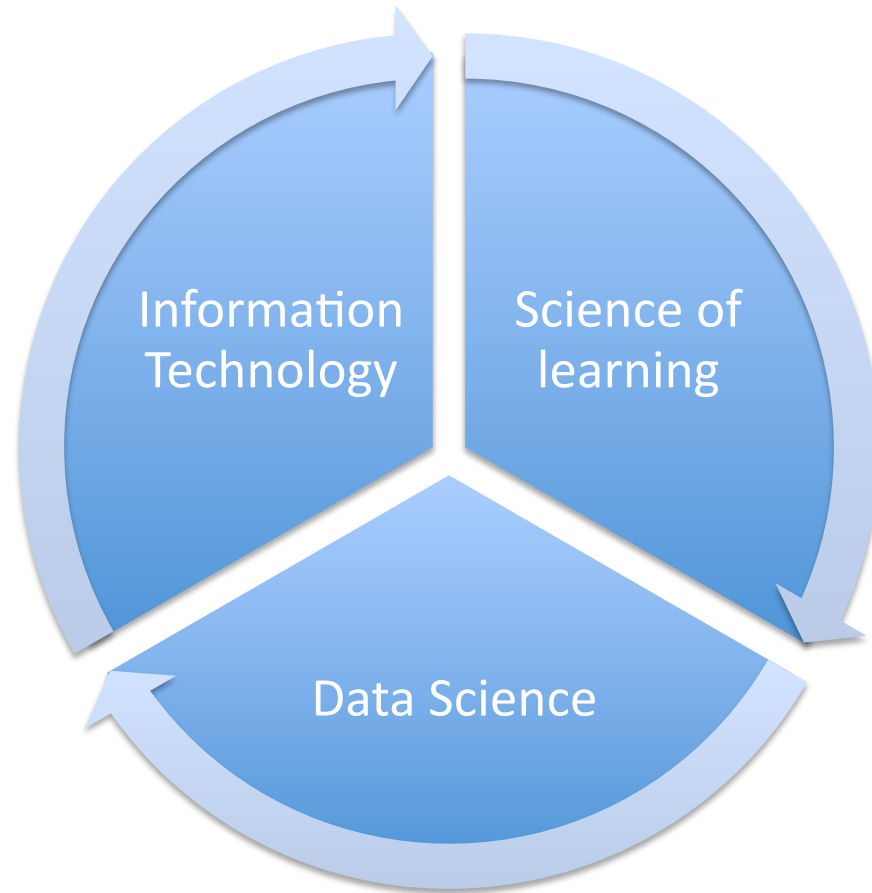
IV. Scaling Up

Observations About Forum

- **Sharp decline rate**
  - Impact on social learning
- **Information overload**
  - Possibility of automatic recommendation

- Not the same as forums like Stackoverflow
  - Focused around one course
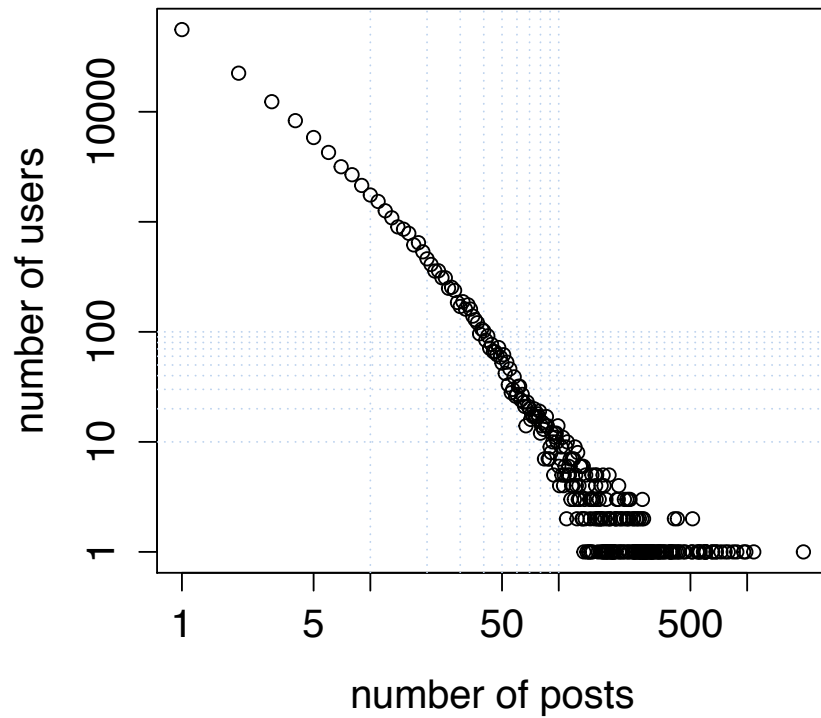 - Both social and tech. discussions

Data

- Summer 2013
- 73 courses on Coursera
  - 8 vocational courses
  - 29 quantitative (non-vocational) courses
  - 36 other courses
- 115,922 students
- 171,197 threads
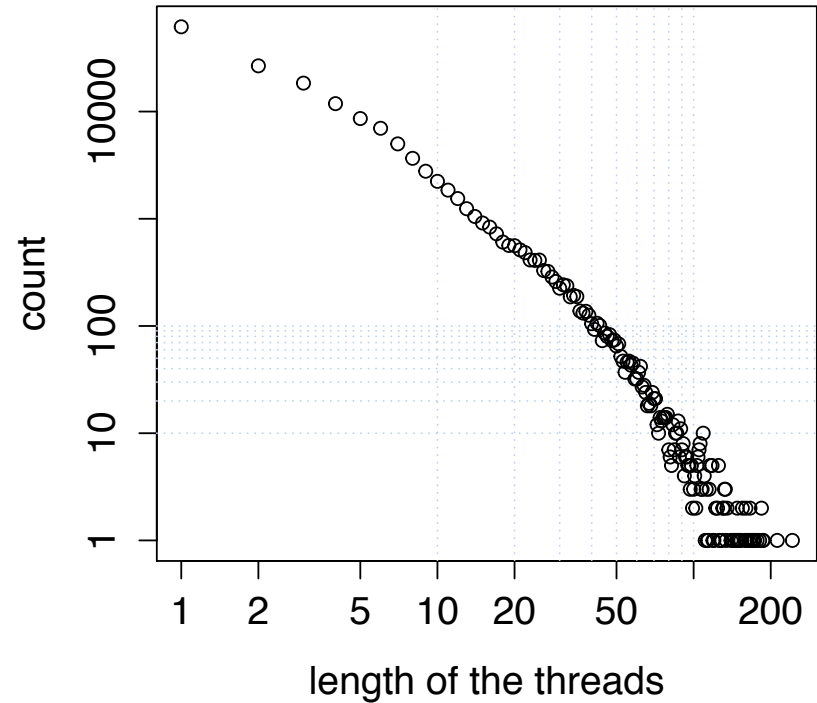- 830,000 posts

Examples
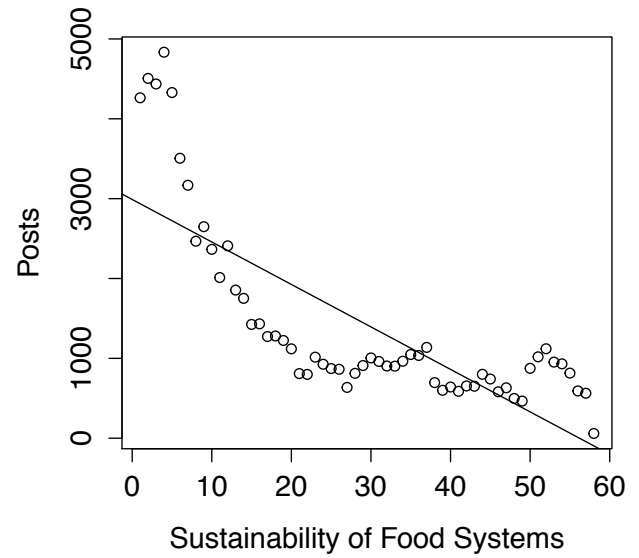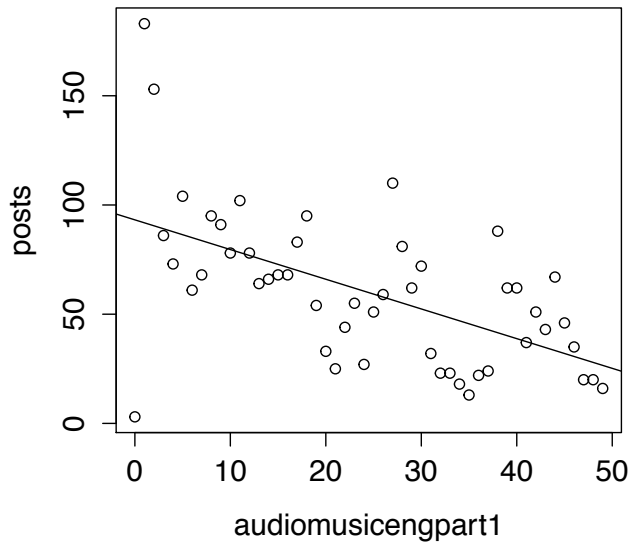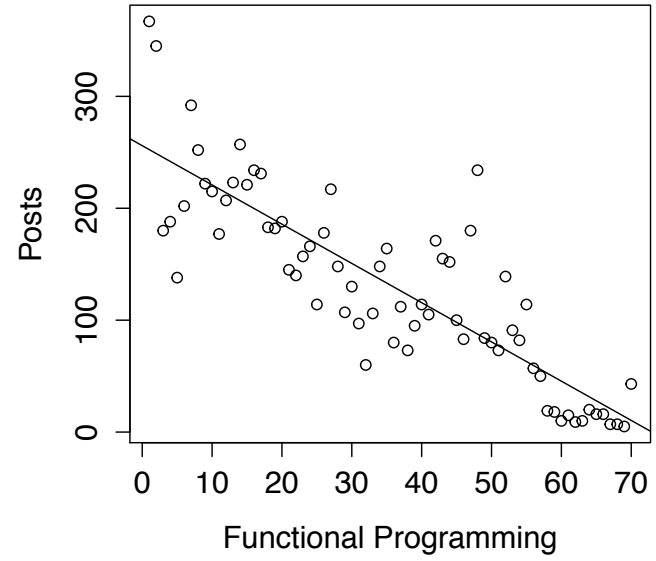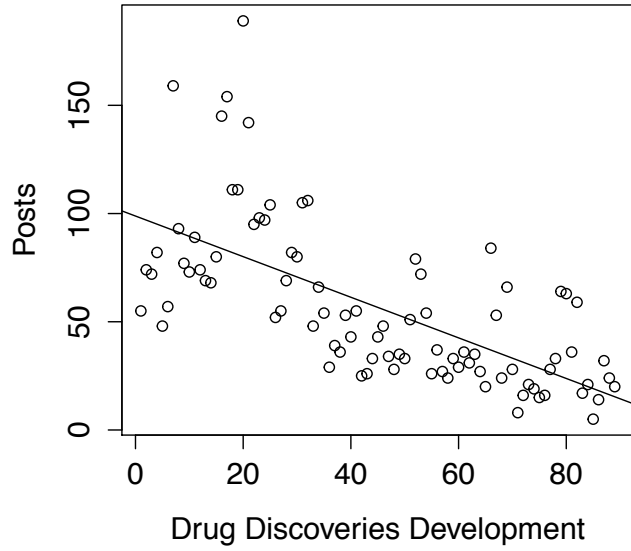
Student Activity & Thread Length

Log−log Plot

Log−log Plot

1. Regression Analysis

- **Quantitative:** smaller initial volume, but slower decline

- **Initial popularity:** light impact on decline rate

- **Teacher participation:** increased volume but similar decline rate

- **Peer-reviewed homework:** much increased volume but slightly increased decline rate

- **More threads** at the same time reduces attention received by each thread

2. Generative Model

- SVM-based classifier
- Topic extraction
- Ranking and recommendation

- Fast converging: 10 days of training suffices
- Accurate keyword extraction
- Twice as accurate as tf-idf

V. Scaling Down

1. Individualization → Scale

Tutor
(1:1)

Lecture
(1:250)

MOOC
(1:50,000)

Individualization
(200:50,000)
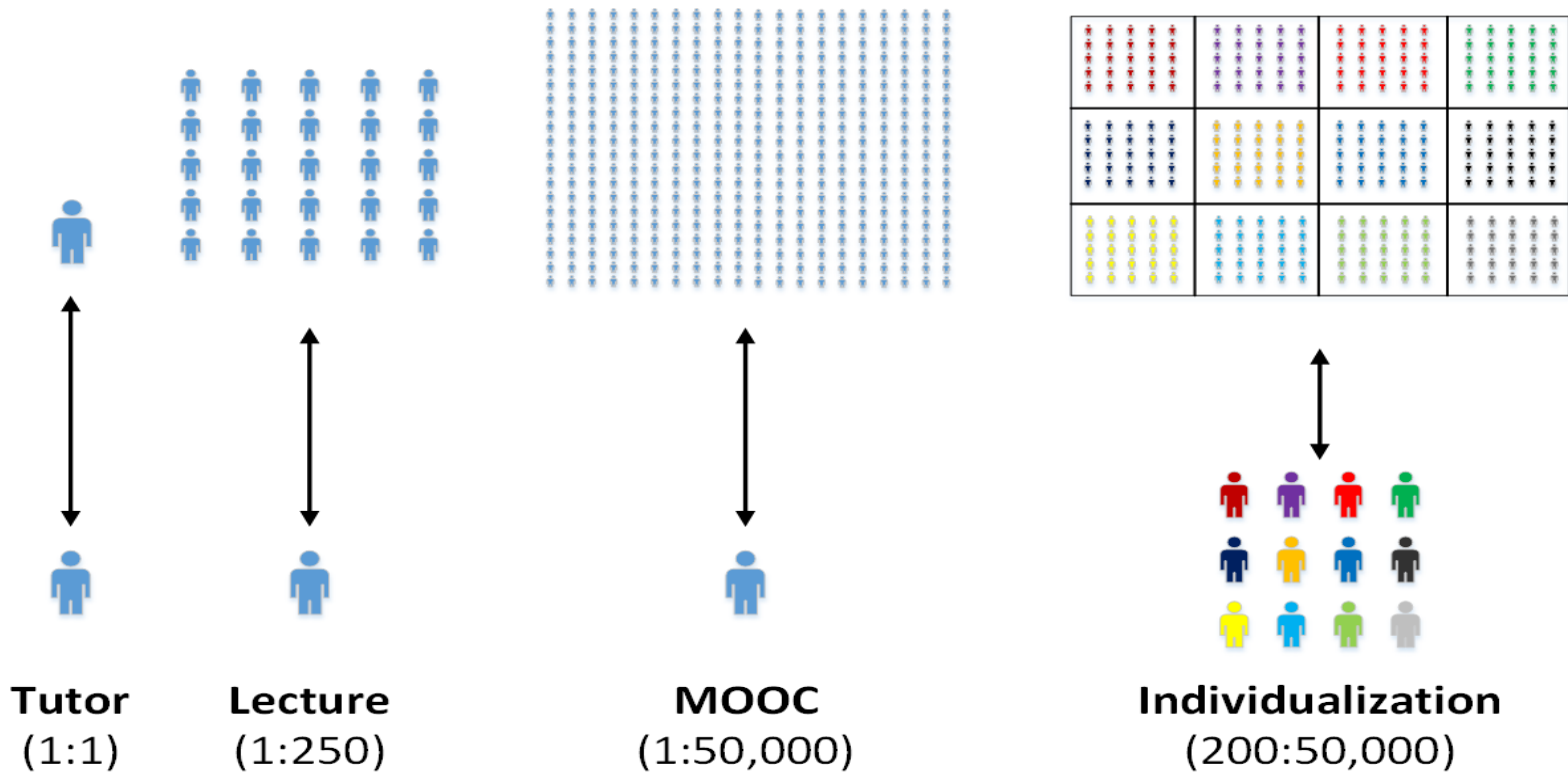
MIIC

- Mobile
  - Meet the challenge of seamless dynamic content modification
- Integrated
  - First system integrating book + lecture + assessment + social learning
- Individualized
  - One course transparently and intelligently turns into "parallel universes"

User Interaction

| Behavioral Measurements | Data Analytics | Content/Pres. Adaptation |
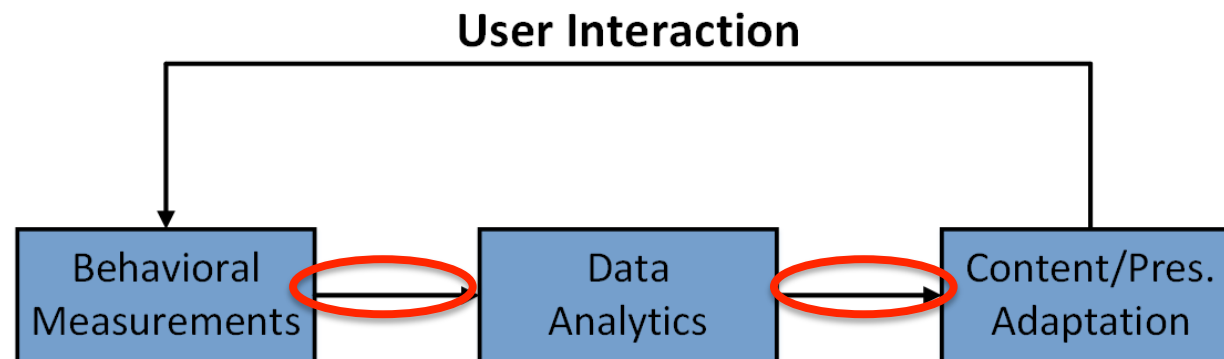
Implementation

- iOS/Android mobile app
- Webkit-based rendering
- PDF/ePub to HTML
- Video hosting
- Assessment database
- Social learning features

- Machine learning engine

- Adaptation logic

Student Trial
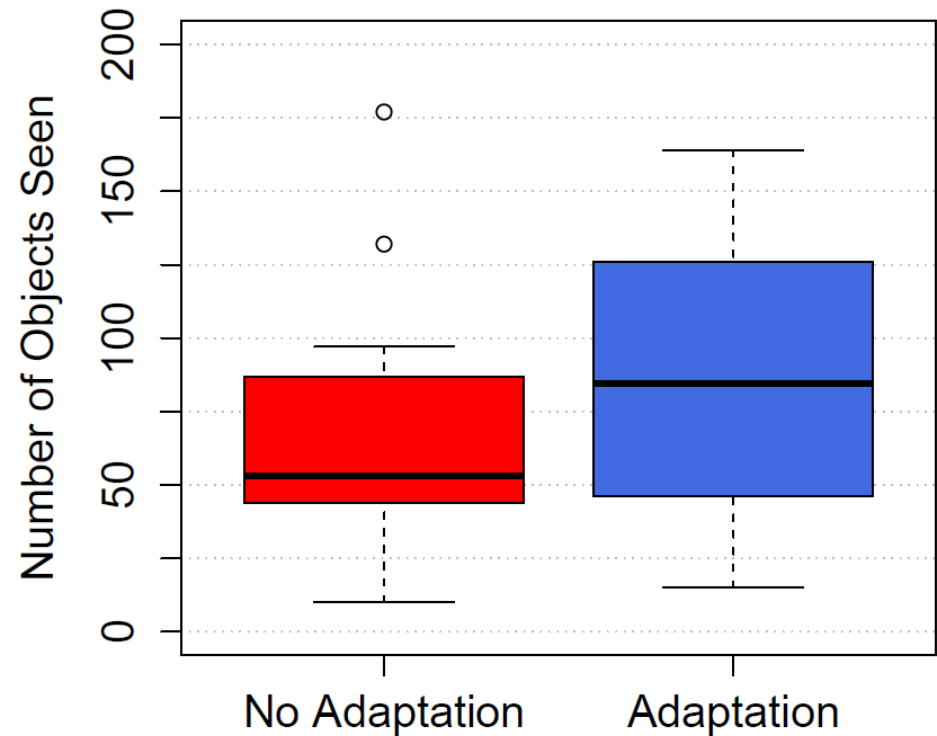
2. Collaborative Filter
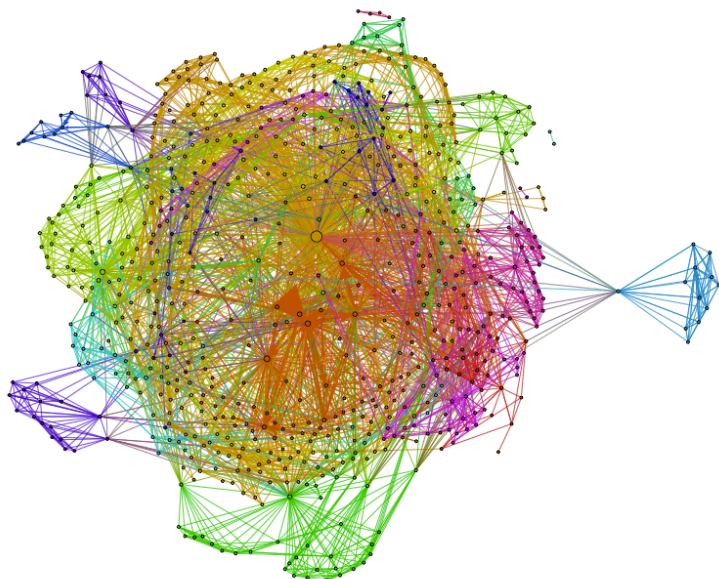
$$\mathbf{R} = \begin{bmatrix} 1 & 0 & 0 & \cdots & - \\ 0 & - & 1 & \cdots & 1 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ - & 1 & - & \cdots & 0 \end{bmatrix}$$

- 3196 students and 69 quizzes, relatively sparse
- Train neighborhood method
- 81% score-prediction accuracy so far

VI. This Experiment We Call MOOC

Long Timescale

- Will be a long time before we have sufficient data to validate the many hypotheses today.
- Tiered models to emerge:
  1. (free) TED talks
  2. $49.99 freshman courses with on-campus tutors
  3. online professional degree

Diverse Expectations

- Extremely diverse set of constituents, with vastly different expectations
- Flipping people is hard

Advancing Pedagogy

- Pedagogical advances need to catch up with business discussions

- Are these millions of people actually learning? What data informs us?

Much More To Learn About Learning

Thank You

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