

**Senate Task Force Report on
Campus Participation in the Coursera Initiative**

**University of Illinois, Urbana-Champaign
July 5, 2012**

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Senate Task Force Report on Campus Participation in the Coursera Initiative

Background

We were asked by the Senate Executive Committee to review Chancellor Wise's proposal that we join the other universities who are part of the Coursera Initiative (<https://www.coursera.org>). Having reviewed the current outline of this initiative, and its future potential for growth, we recommend moving forward with negotiations with the Coursera leadership about our campus becoming a partner and a contributor to this experiment. Its overall commitment to providing affordable educational opportunities on a very wide scale fits in well with our values and mission as a public, land grant university.

This is a high-profile technology initiative involving top-tier institutions. It would be beneficial from a status standpoint to be associated with it (and them), and it would draw attention to our wider e-learning portfolio. Additionally, many of the aspects of Coursera align with educational approaches that have been promoted in recent campus teaching excellence retreats. The Coursera initiative has wide visibility and a good reputation nationally. If by being partners we will be able to contribute to and help shape the initiative, all sides can benefit. Coursera has significant venture capital funding, which would allow further experimentation and innovation; our campus's long-standing experience with online courses and programs could make a positive contribution to the initiative.

Moving forward, we see two areas of potential questions that will need to be addressed in order for this agreement to be fully beneficial to the campus. In this report we break these matters down into two categories: (1) matters that raise questions for our campus itself to answer; and (2) matters that will require further discussion with Coursera about our relationship with them and the substance of our involvement.

Where our committee has recommended positions on these questions, we have included them; in other instances, such decisions will require broader campus deliberation and consultation. Nevertheless, we do believe that exploratory discussions with Coursera can begin now, even as these wider campus questions and policies get settled. Our committee believes that there are reasonable policy solutions to all the questions raised here, and none of them need to be obstacles to initiating conversations with Coursera.

Questions for our campus to answer

1. *How does our participation in the Coursera initiative fit within the context of a wider campus e-learning strategy?*

The IT Teaching and Learning Committee and other groups have been calling for a clearer overall campus vision of what we are trying to become in this area of growing importance for higher education. Coursera can be a valuable part, but only a part, of that wider strategy. Ideally, the announcement or rollout of joining the Coursera initiative should be made in the context of its relationship to that wider vision and strategy; in part, we see this initiative as an opportunity to articulate at least the broad outlines of such a strategy.

2. *How do we avoid the concern that this will turn out to be “another Global Campus”?*

Presenting a clear public rationale for involvement with Coursera, and its place within a wider campus strategy, will go some way toward assuaging concerns about “putting all of our eggs into one basket” or adopting a one-size-fits-all orientation. Other concerns will likely echo issues raised with the ill-fated Global Campus here. To these concerns, we find it pertinent to remind people that, unlike GC, this initiative:

- (a) requires no payments to Coursera;
- (b) is entirely voluntary at the faculty and unit level;
- (c) keeps course ownership entirely with the university and its faculty, not with Coursera;
- (d) can be ended at our discretion if we determine that the relationship is not serving our interests;
- (e) will be subject to regular review and re-evaluation, within ordinary campus academic governance processes.

3. *What is the Coursera financial model? Does it work for us?*

Coursera is premised on the free provision of online courses in a “MOOC” (Massive Open Online Course) format. They say they will never charge for course access, and will never accept advertising. They expect to monetize the site by providing ancillary services for a fee. Incoming revenues would be shared with the university and, depending on campus policies, with the units and faculty members involved. (*For more background on Coursera, see Appendix 2.*)

Many believe that these free courses will provide an avenue for outreach and public service on a global scale, providing knowledge, information, and skills to a wider audience not being served currently by universities. Yet, because our campus is also seeking to expand, not eliminate, our for-fee course and degree

online options, this relationship needs to be thought through carefully. One possibility to explore is the possible value of offering sample courses at no charge as a path to matriculation in a program that charges tuition.

4. Who will manage the relationship with Coursera? Who will be the key point of campus contact? Who will be negotiating terms for the campus?

5. Who will be paying for new course development or the adaptation of existing courses for Coursera?

Faculty and unit participation in the Coursera initiative must be voluntary, but campus and unit funds will be needed to incentivize participation. Who is responsible for developmental funding, which will likely include video and production costs? Can state funds be used for this purpose, or will we need to draw from gift funds or other sources?

If funding is solely a unit responsibility, some parts of campus may be effectively excluded from potential participation. How much are we draining away from developmental resources that could be used to grow our online offerings more generally – or can these Coursera and non-Coursera activities be made cross-subsidizing in some way? Any significant revenues remain hypothetical at this stage, both in terms of amount and timing.

6. Who will decide which campus courses will be featured on the Coursera site?

There will need to be a process for selecting the courses that we want to have representing us in Coursera, because part of their model seems to be including only the best courses and instructors from each institution. This might involve some kind of campus committee that will select course proposals for developmental funding, and/or choose those that we want representing the campus in Coursera.

Questions to be addressed: What are the curriculum areas in which our campus can make its most effective and distinctive impacts? Should we rely on adapted versions of existing courses (which is what Coursera institutions do now) or should more specialized courses be developed specifically for this initiative? How many courses do we want to make available through Coursera? What is our time frame for developing them, reviewing them, and posting them to the Coursera site?

7. How will new or adapted courses be approved? Will they be for credit?

Course development, approval, and evaluation for new Coursera courses should, we believe, follow the same procedures of department, college, and campus review as any other courses. In some cases, Coursera versions of courses might draw from (and therefore help promote) existing courses and programs. In other cases we might want to develop new, standalone courses especially tailored for the Coursera audience. The seven or eight week model of Coursera courses means that these would not be equivalent in content to regular Illinois courses.

These Coursera courses should not be for UI credit (no other Coursera participant is offering them for credit). We therefore need to decide how these courses will be identified – for example, Michigan calls theirs, not University of Michigan courses, but “courses offered by University of Michigan faculty.”

8. What intellectual property policies should govern course development and ownership?

We believe that existing IP rules should be applied here as in any case of course development. (See General Rules: Article III, Section 2: <http://www.uillinois.edu/trustees/rules.cfm#art3>) These rules state, in part, “Traditional academic copyrightable works created with use of University resources over and above those usually and customarily provided shall be owned by the creators but licensed to the University. The minimum terms of such license shall grant the University the right to use the original work and to make use of derivative works in its internally administered programs of teaching, research, and public service on a perpetual, royalty-free, non-exclusive basis.” Presumably, courses developed for Coursera using additional campus or unit support would fall under this rule. On the other hand, would the provision of such a course via Coursera constitute an “internally administered program of teaching,” or something different?

9. If/when revenues start coming from Coursera course offerings, how will they be shared between the campus, unit, and faculty member?

In general, we favor a formula that shares revenues with the unit and faculty member who developed the course. The precise formula may depend on whether campus or unit resources went into course development. It is possible to imagine faculty developing a course entirely through their own time and resources, and still wanting to offer it via Coursera.

10. Will developing and teaching a Coursera course be counted as on-load, or as (paid) overload?

This question must be carefully deliberated. Due diligence demands that we consider how state resources may and may not be used in this venture. Given

that MOOCs are offered free of charge to the world, we must consider whether Illinois' involvement might be seen by the state as a conflict of commitment. This may require that any Coursera course development and teaching be carried as overload. Moreover, without wanting to inhibit entrepreneurial thinking, we believe there needs to be campus-wide consistency in issues relating to faculty workload and compensation.

A few specific questions to consider are these:

- (a) If a course is developed for Coursera with an expectation that it will generate revenues (from ancillary services), is it permissible to use state funds or state-supported faculty time for development and administration of the course?
- (b) Would this teaching count as teaching for another institution, and how does it fit with other policies we have about "double dipping"?
- (c) Are there conflict of commitment issues at stake, or is this like running a startup or consulting on one's own time?

11. How will we make our Coursera offerings fully ADA-compliant, and who will bear those costs?

Our own committee's view is that not only must we be compliant with the legal requirements, we should go beyond the minimum required if our courses will be featured on the Coursera site. This would mean, for example, doing better than auto-transcription for audio or video files. This is one of the ways in which Illinois' history of experience and expertise can be a resource for the Coursera initiative generally. Our division of Disability Resources and Education Services (DRES) has prepared an outline of goals for us in this area (*see Appendix 1*). In some cases, such as Coursera's model of peer-to-peer evaluation, strict adherence to ADA requirements could be complicated and expensive.

12. Other policy issues?

In addition to the proposed committee that would review courses nominated for Coursera, there may be other issues requiring administrative and/or faculty governance review. For example, because these courses may have thousands, even tens or hundreds of thousands of enrollees, there may be a need to establish policies on, for example, assigning your own textbook as required reading, and potential conflicts of interest in doing so.

Questions to raise with Coursera

1. What are the benefits to Illinois of being an early partner in the Coursera initiative? What role would our representatives have in helping to shape or influence Coursera

policies generally? What role do other university partners (Stanford, Princeton, Michigan, and Penn) currently have?

2. How flexible/adaptable is the Coursera instructional model?

Despite its merits as a learning platform, it is possible to question the “MOOC” framework as a useful but limited instructional model. We ought to be clear about how this approach fits into our own instructional philosophies. Best of all would be if, by joining the Coursera group, we can shape and influence their instructional model.

3. Who owns the data generated by Coursera users?

A tremendous amount of user data is generated by course management applications. Who has access to these data for analytical purposes? There are many empirical questions about the instructional effectiveness of, for example, Coursera’s peer-to-peer evaluation model, or the efficacy and impact of ADA accommodations in achieving their intended purpose. Who is responsible for carrying out such research, and will initiative partners, like Illinois, have a potential role in conducting such research?

4. One of the stipulations of the agreement is that Coursera courses have a “shelf life” and will be periodically reviewed and rotated out of circulation. Who will make that decision? How will courses be evaluated, and what criteria will be used in making this decision? Will regular updates/revisions of course content be required (and who will pay for that)?

5. Some of our primary interests in providing MOOC courses are in keeping with our land-grant mission: agriculture, veterinary medicine, outreach and service to public schools, as well as engineering and other professional and technical fields. In many cases there is a particularly strong global audience and need for free knowledge, information, and skills in these areas. Is reaching these audiences with these kinds of courses a priority for Coursera? Is providing courses in languages other than English a priority?

APPENDIX 1

Massive Open Online Course: DRES Comments Regarding Accessibility Requirements, Issues, Questions and Next Steps

Compliance with the Americans with Disabilities Act (ADA) and Illinois Information Technology Accessibility Act (IITAA) is both a requirement and a pedagogically beneficial practice that enhances the learning experience of all students. Web courses that are compliant support multi-modal instructional strategies that more robustly complement the learning styles/preferences of all students, not just those with disabilities. Such courses offer multiple means for students to demonstrate knowledge, understanding, and competence. It also bears noting that Illinois is internationally renowned for its leadership in disability access. As a result, Illinois MOOC students with disabilities will expect our courses to reflect the highest standards with regard to accessibility. Finally, compliance based upon the traditional model of ad hoc, individualized accommodation is not viable given the scale of Coursera classes.

Specific Disability Access Questions

1. Who bears the costs of making our Coursera courses fully ADA compliant?
 - a. In building a business plan for this enterprise it will be essential that additional resources be allocated to cover the cost of incorporating accessibility from the beginning. This includes considering the accessibility of the technologies being used to create course materials. Some technologies are much more expensive in time and/or training costs to make accessible content than other technologies. The College of AHS and DRES are developing a cost recovery model for services that are requested by units or to accommodate constituencies with disabilities other than residential Illinois students.
2. What are the critical accessible design features of online instruction?
 - a. Text captioning of all orally presented content (synchronous and asynchronous). To that end, auto-translation systems are highly variable in their accuracy and should be avoided, especially if the course is offered for credit, certification and for a fee.
 - b. Closed captioning of all multimedia. Must address move to automation and various systems in use to provide this function (You Tube, Stanford)

- c. All podcasts must have transcripts of the audio content.
 - d. Verbal/textual descriptions of graphical/visual data must be incorporated.
 - i. This is not a function that a technician can perform. Rather, it must be done by someone who understands the learning objective that the content is intended to support and who can succinctly articulate a text description that communicates the information that the instructor intends the visual content to convey to sighted students. In etext at Illinois, this has been accomplished by assigning a graduate student to render draft textual descriptions that are subsequently reviewed and edited as necessary by the instructor.
 - e. Asynchronous means of communicating/interacting are required when the impairment compromises the ability of the student to communicate quickly enough to participate in synchronous interactive sessions.
 - f. Access to graphical content (maps, graphs) in a tactile format for students with visual processing, acuity, and/or field loss.
 - g. Use of Blackboard Collaborate or other LMS system that affords comparable accessibility.
 - h. Textbooks and other readings, required or supplemental, are provided in an accessible electronic format to ensure that they are readily available to students with disabilities that substantially impede or preclude print use. The structure of the content would need to be consistent with the Illinois best practices for HTML, if web based (criteria are available at: http://itaccessibility.illinois.edu/html_best_practices/index.php). Non-web based formats (e.g., Word, PDF, PPT) must meet IITAA specifications (criteria available at: <http://www.dhs.state.il.us/page.aspx?item=32765>)
 - i. Mathematical equations and other formulaic content must be rendered in an accessible format (e.g., La TeX, MathML, descriptive text) to ensure that it is screen reader compatible. For it to be manipulated by persons who must rely on auditory processing/learning it must be rendered in LaTeX or MathML.
 - j. Interactive Software learning objects are accessible and comply with WCAG 2.0 Level AA requirements.
3. What are the most significant course policy concerns from the standpoint of disability access?
- a. It is understood that the initial courses will not be for credit, however, if MOOCs were offered for credit, certificate, or for a fee,

the ability to adjust the due dates for assignments, exams, and/or course completion in response to disability-specific needs would be required.

- b. Also, if/when MOOCs are offered for credit or fee, and policy modifications are requested on the basis of disability, it would be extremely difficult, if not impossible, with such large numbers of enrollees to enact a disability verification process to validate the requests for adjustments/modifications.
 - c. Quizzes may be incompatible with the abilities of students with disabilities who may require additional time to respond (require longer to process textual description of graphical information with visual cues).
 - d. Timed exam parameters may be insufficient for certain individuals with disabilities.
 - e. Crowdsourced grading is potentially problematic in that the documents being submitted for class review/evaluation must be accessible to classmates with disabilities. Also, it is likely that students using assistive technology will not be able to communicate accurately in a timely manner, thus constraining their participation in crowdsourced activities and/or potentially outing them inadvertently as persons with disabilities.
4. What are the major course production and execution “process” questions related to disability access?
- a. How will each course development team accommodate the inclusion of a person with responsibility for learning about and ensuring the accessibility of the course materials and resources?
 - b. What production and validation processes will be used to ensure the use of accessible design best practices?
 - c. What IT specifications does Coursera have and are those technologies (e.g., video player, document reader) compatible with the wide range of AT used by persons with disabilities (e.g., screen reader, math reader, braille display)?
 - d. Can an accessible LMS (e.g., Blackboard Collaborate) be used inside Coursera?
 - e. Does Coursera have a required template structure for creating content? If so, what are the requirements?
 - f. How likely is it that Coursera.org universities will work collaboratively and cost share resources to address common needs like accessibility? Do Coursera and the other institutional members have MOOC accessibility contacts, and if so, who are they?
5. What are the next steps?

- a. It is the DRES position that the overriding opportunity here is to “pilot” a new process on crafting online course content that includes accessibility from design to deployment.
- b. DRES would like to audit two of the more complex Coursera courses (containing video, quizzes, variable types of textual and graphical course materials). Preferably one would be a STEM course and the other non-STEM, to review their strengths/weaknesses with regard to accessibility.
- c. If the campus decides to proceed, DRES should partner with faculty in designing an accessible STEM and a non-STEM MOOC that could serve as effective practice models for subsequent MOOCs. This process has been used to create the inaugural etext.Illinois.edu ebook design criteria and development procedures and has worked well.

APPENDIX 2

(Background briefing on Coursera, developed by Rob Rutenbar, Computer Science)

SEC Ad Hoc Committee on On-Line Education & Coursera

Rob A. Rutenbar
Nicholas C. Burbules



COMPUTER SCIENCE • UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN



Background: the MOOC Universe

- **MOOC = Massive Open Online Course**
 - Massive = enrollments of 10,000 – 100,000
 - Open = anybody can sign up and view/take the course
 - Online = use internet technology to deliver

- **Peers like Stanford, MIT pioneering experiments**
 - Experiments are evolving to create “platforms” where others – like UIUC – can join

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Virtual and Artificial, but 58,000 Want Course

By JOHN MARKOFF
Published: August 15, 2011

PALO ALTO, Calif. — A free online course at [Stanford University](#) on artificial intelligence, to be taught this fall by two leading experts from Silicon Valley, has attracted more than 58,000 students around the globe — a class nearly four times the size of Stanford's entire student body.

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Noah Berger for The New York Times
The teachers, from left, Peter Norvig and Sebastian Thrun.

The course is one of three being offered experimentally by the Stanford computer science department to extend technology knowledge and skills beyond this elite campus to the entire world, the university is announcing on Tuesday.

The online students will not get Stanford grades or credit, but they will be ranked in comparison to the work of other online students and will receive a “statement of accomplishment.”

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Aside: Why Now? Is this really new?

Common reaction: We've been doing online courses forever; what's really **new** here?

- (1) Technology enablers
 - Broadband internet has become commonplace
 - This means anybody, anywhere can view high-quality **video content**, without undue expense. This is new, last 5 years



The image shows a screenshot of the Netflix website. At the top, the Netflix logo is on the left, and a phone icon with the text "Questions? Call 1-866-579-7172 24 hours a day" and a "Member Sign In" link are on the right. Below the header, a large banner reads "Instantly watch as many TV episodes & movies as you want! For only \$7.99 a month." The background of the banner shows a family of four sitting on a couch in a living room, watching a TV. The TV screen displays the Netflix interface with a grid of movie and TV show thumbnails. Overlaid on the right side of the banner is a sign-up form titled "Try Netflix Free for 1 Month". The form includes fields for "Email address" and "Create a password", a blue "Start Your Free Month" button, and a small lock icon with the text "Secure Server. We will not sell or rent your email address. We may contact you about the Netflix service. See our Privacy Policy. Free trial offer details".

Aside: Why Now? Is this really new?

Common reaction: We've been doing online courses forever; what's really **new** here?

■ (2) Pedagogical innovations

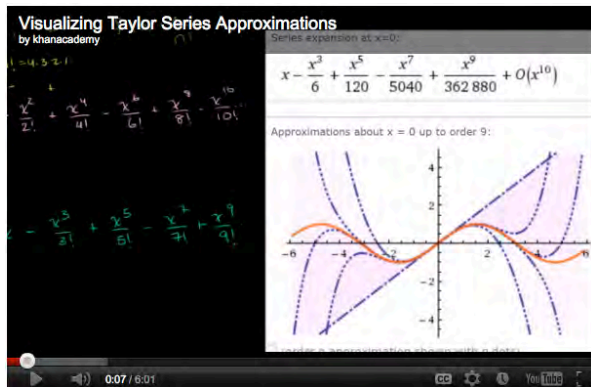
- Impressive results via video-based teaching
- Notably: Salman Khan, now Khan Academy.
- Big concept: *Flipping the classroom*

The screenshot shows the Khan Academy website interface. At the top, it says "153,660,560 lessons delivered" and "KHANACADEMY". There is a search bar and navigation links for WATCH, PRACTICE, COACH, VOLUNTEER, and ABOUT. The main content area features a video player titled "Euclid as the Father of Geometry" with the subtitle "The laws of nature are but the mathematical thoughts of God." - Euclid. The video player shows a scene of Euclid teaching his students, with handwritten notes in green and red: "Geometry", "1570", "Latin", and "Arabic". To the right of the video player is a thumbnail of the title page of "The Elements" by Euclid. Below the video player, there is a "Watch. Practice." section with the text "Learn almost anything for free." and a description: "With over 3,200 videos on everything from arithmetic to physics, finance, and history and hundreds of skills to practice, we're on a mission to help you learn what you want, when you want, at your own pace." There are two buttons: "Watch a Video" and "Take a Challenge". Below that, there is a link for "Teacher or administrator? Explore our Teacher Resources." and social media sharing options for Facebook (887k likes), Send, Twitter (27.7k tweets), and +1 (17k). At the bottom, there is an email sign-up form: "Enter your email to learn about new courses." and a "Get Updates" button.

Internet Allows for “Flipping the Classroom”

(Aimed mainly at K-12, but also being used for ‘in-class’ undergrad instruction)

- At home: *Watch vid of lec*



- Watch this:
Salman Khan TED 2011 talk

TED Ideas worth spreading

Talks	TED Conferences
Speakers	TEDx Events
Themes	TED Prize
Translations	TED Fellows

TALKS

Salman Khan: Let's use video to reinvent education

TED2011, Filmed Mar 2011; Posted Mar 2011



- In class: *do HW prob solving*



Stanford Did First Large-Scale Experiments

- **Stanford MOOCs**
 - Multiple classes online, at planetary scale
 - Computer Science at first
 - Artificial Intelligence class (right) had 160K students from 190 countries sign up (!)
 - Stanford spins off multiple companies from these ideas

- **Extraordinary national press**
 - NYT article at left
 - And many others



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Noah Berger for The New York Times
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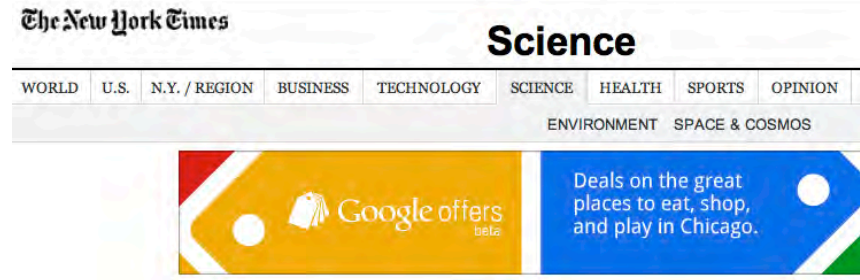
The online students will not get Stanford grades or credit, but they will be ranked in comparison to the work of other online students and will receive a “statement of accomplishment.”

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Stanford Making *Broad* Claims

- Ex: Daphne Koller
NYT editorial
- Approximate summary:
 - Still lecturing PPT slides to physically present students?
 - ...you can do *better* with flipped-classroom tech



ESSAY
Death Knell for the Lecture: Technology as a Passport to Personalized Education

By DAPHNE KOLLER
Published December 5, 2014

Our education system is in a state of crisis. Among developed countries, the United States is 55th in [quality rankings](#) of elementary math and science education, [20th in high school completion rate](#) and [27th](#) in the fraction of college students receiving undergraduate degrees in science or engineering.



Daphne Koller

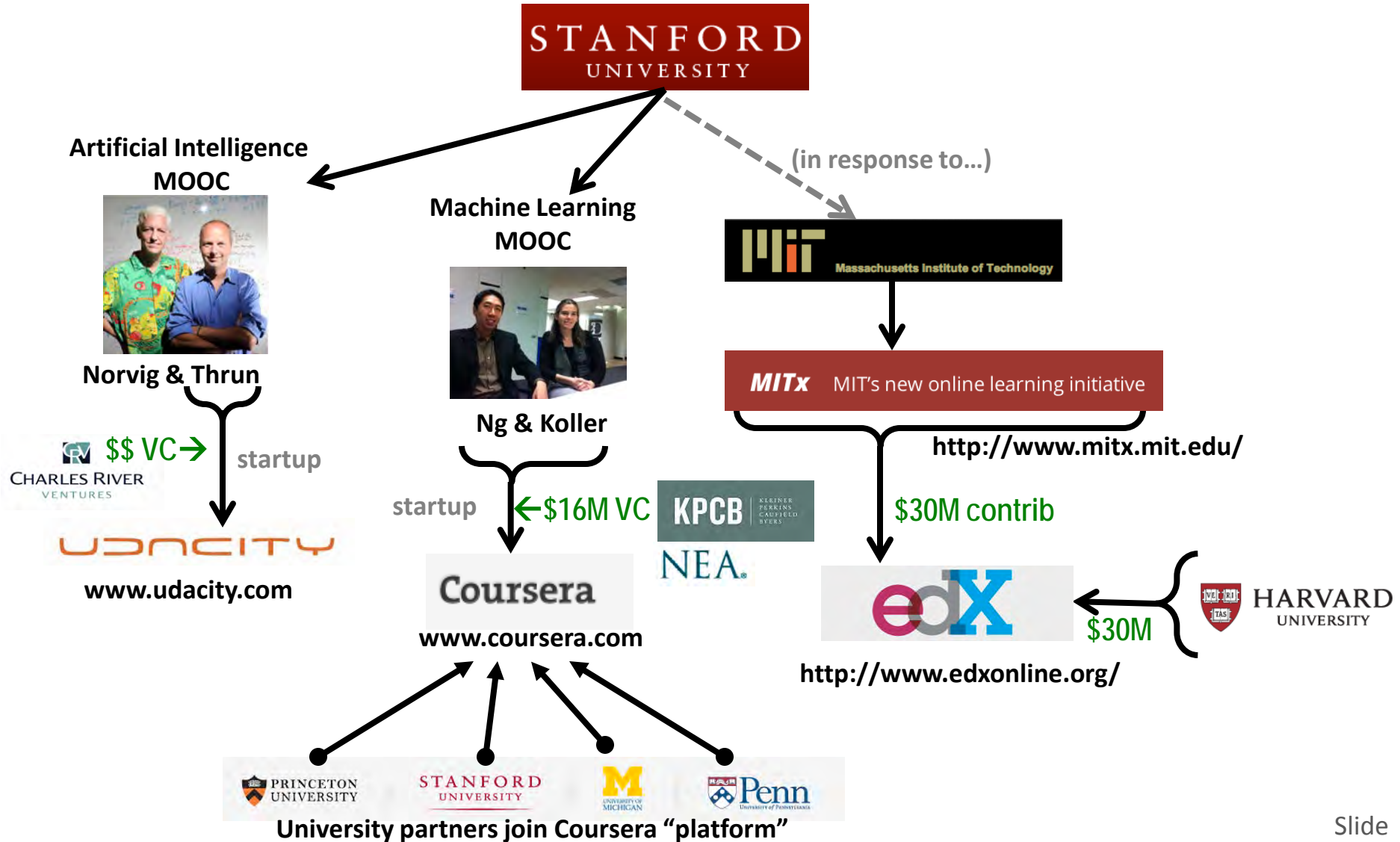
As a society, we can and should invest more money in education. But that is only part of the solution. The high costs of high-quality education put it off limits to large parts of the population, both in the United States and abroad, and threaten the school's place in society as a whole. We need to significantly reduce those costs while at the same time improving quality.

If these goals seem contradictory, let's consider an example from history. In the 19th century, 60 percent of the American work force was in agriculture, and there were

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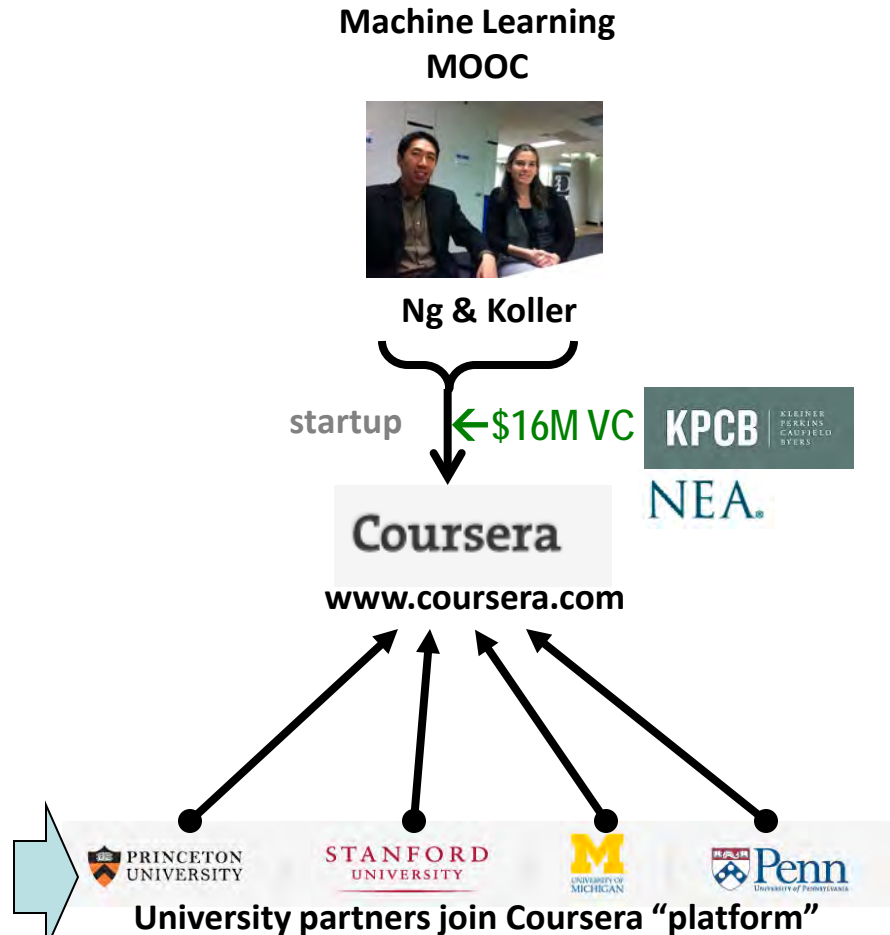
Ecosystem of MOOC Companies, Consortia, Emerges



MOOC Ecosystem: Coursera

- **Coursera is a MOOC platform provider**
 - They are not a “Stanford” thing, they are “neutral” on partner content
 - They seek to partner with strong schools to provide their course content
 - Funded by another pair of top-tier venture capitalists
 - They are for-profit, and share revenues with schools

- **Some of our elite peers are (or will soon be) partners**



About Coursera

- **New startup company, out of Stanford**
 - Started by two Stanford Computer Science faculty: Daphne Koller and Andrew Ng
 - Based on experience with several courses taught at Stanford
 - After Ng & Koller did their pilot course, others at Stanford piloted own classes, with success, using their platform
- **Recently received \$16M initial funding from VC**
 - Top tier silicon valley VC firms: Kleiner Perkins & NEA
 - Same folks who funded Amazon, Google, Apple, etc
- **Enormous press coverage of late**

Coursera: Very, Very Visible

■ David Brooks, NYT

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OP-ED COLUMNIST
The Campus Tsunami
By DAVID BROOKS
Published: May 3, 2012

Online education is not new. The University of Phoenix started its online degree program in 1989. Four million college students took at least one online class during the fall of 2007.



But, over the past few months, something has changed. The elite, pace-setting universities have embraced the Internet. Not long ago, online courses were interesting experiments. Now online activity is at the core of how these schools envision their futures.

This week, [Harvard](#) and the [Massachusetts Institute of Technology](#) committed \$60 million to offer free online courses from both universities. Two Stanford professors, [Andrew Ng](#) and Daphne Koller, have formed a company, [Coursera](#), which offers interactive courses in the

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WATCH THE TRAILER

Josh Haner/The New York Times
David Brooks

■ and Thomas Friedman, NYT

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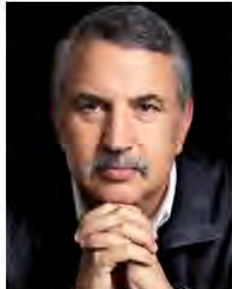
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If you have a \$500,000 portfolio, download the guide for retirees by *Forbes* columnist firm. It's called "The 15-Minute Retirement Plan." Even if you have something else sense to request your guide! [Click Here to Download Your Guide!](#)

OP-ED COLUMNIST
Come the Revolution
By THOMAS L. FRIEDMAN
Published: May 15, 2012 | 370 Comments

Palo Alto, Calif.



Andrew Ng is an associate professor of computer science at Stanford, and he has a rather charming way of explaining how the new interactive online education means many that he cofounded, [Coursera](#), hopes to revolutionize higher education by allowing students from all over the world to not only hear his lectures, but to do homework assignments, be graded, receive a certificate for completing the course and use that to get a better job or gain admission to a better school.

"I normally teach 400 students," Ng explained, but last semester he taught 100,000 in an online course on machine learning. "To reach that many students before," he said, "I would have had to teach my normal Stanford class for 250 years."

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Josh Haner/The New York Times
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Online Education Venture Lures Cash Infusion and Deals With 5 Top Universities (April 18, 2012)

What Coursera Does, 1

- **Content-neutral platform for online delivery of MOOCs**
 - Available for free to anybody with a browser and access to broadband internet to stream the video content
 - *Content neutral* means: the user taking the course sees the academic institution as the “branded” view of the course
- **Hosting & delivery of the course**
 - The course lives on computers managed by Coursera
 - (Coursera actually outsources this to Amazon’s EC2 cloud)
 - We would not incur any IT costs to run these courses

What Coursera Does, 2

- Allow for a wide range of modes of instruction, delivered as short videos, to viewing students
- Example: writing on a slide using a tablet computer

The screenshot shows a video player interface for a Coursera lecture. The video content displays a handwritten graph diagram titled "Example" illustrating Dijkstra's algorithm. The graph has four nodes: S, V, W, and T. Node S is the source, and node T is the target. The edges and their weights are: S to V (weight 1), S to W (weight 4), V to W (weight 2), and W to T (weight 3). A handwritten note indicates that node S is in the source set with $A(S)=0$ and $B(S)=\emptyset$. Node V is also in the source set with $A(V)=1$ and $B(V)=\{S, V\}$. A handwritten note next to node V says "Dijkstra's greedy Score for (V, W) : $A(V) + 2w$ ". A handwritten note next to node W says "X (2nd iteration)". A text box at the bottom of the video frame says "So now we go to the next iteration of the while loop. So with our new set". The video player shows a progress bar at 02:01/12:45 and a speed of 1.00x.

What Coursera Does, 3

- Offers sophisticated tools for auto-quiz, auto-grading
- Example: in-video quiz, from Stanford class
 - Can stop the video and insert a quiz

The screenshot shows a Coursera video player interface. The video title is "Stanford University Cryptography". The video content is paused at a quiz titled "Attack 1: two time pad is insecure !!". The quiz text reads: "Never use stream cipher key more than once !!". Below this, two equations are shown: $C_1 \leftarrow m_1 \oplus \text{PRG}(k)$ and $C_2 \leftarrow m_2 \oplus \text{PRG}(k)$. The text "Eavesdropper does:" is followed by the equation $C_1 \oplus C_2 \rightarrow$ and a text input field containing "m1 XOR m2". A speech bubble points to the input field with the text "use the keyword XOR to indicate xor operation". A green "Correct!" message is displayed at the bottom left of the quiz area. The video player controls at the bottom show the video is at 02:19:25.14, with a speed of 2.00x.

What Coursera Does, 4

- Offers tools for editing/creating these inline quizzes
- Example: from Stanford class on Artificial Intelligence

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Stanford University
Probabilistic Graphical Models

Daphne Koller
Professor of Computer Science

Editing Quiz: Bayesian Network Fundamentals

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[Edit Quiz Settings](#) [Edit Quiz Preamble](#)

Question 1 Settings

Variation 1
Factor product. Let X, Y be binary variables, and let Z be a variable that takes on values 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Variation 2
Factor product. Let X, Y and Z be binary variables.

[Click and drag to re-order questions.](#)

[Add Variation](#)

Question 2 Settings

Variation 1
Factor reduction. Let X, Z be binary variables, and let Y be a variable that takes on values 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Variation 2
Factor reduction. Let X, Z be binary variables, and let Y be a variable that takes on values 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Variation 3
Factor reduction. Let X, Z be binary variables, and let Y be a variable that takes on values 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

[Click and drag to re-order questions.](#)

[Add Variation](#)

Question 3 Settings

Variation 1
Properties of independent variables.
Assume that A and B are independent random variables.

[Click and drag to re-order questions.](#)

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Variation 1

Question Type: Checkboxes

Text

*Naive Bayes. Consider the following Naive Bayes model for flu diagnosis.

```

    graph TD
      Flu((Flu)) --> Fever((Fever))
      Flu --> Fatigue((Fatigue))
      Flu --> Cough((Cough))
      Flu --> Headache((Headache))
      Flu --> SoreThroat((Sore Throat))
      Flu --> MuscleAches((Muscle Aches))
    
```

Which of the following statements are true in this model? You may select 1 or more options (or none of them, if you think none apply).

Explanation

Because this is a Naive Bayes model, two things are true: 1) all symptoms are dependent of each other when the Flu variable is unobserved, and 2) all symptoms are independent when the Flu variable is observed.

Rescale Score: 1

Option Group 1

Select all

Text

Say we observe that 1000 people have the flu, out of which 500 people have a headache (and possibly other symptoms) and 500 have a fever (and possibly other symptoms). We would expect that approximately 250 people with the flu also have both a headache and fever.

Explanation

Given that someone has the flu, whether he has a headache is independent of whether he has a fever. We can thus calculate:

$$P(\text{Headache} = 1, \text{Fever} = 1 | \text{Flu} = 1) = P(\text{Headache} = 1 | \text{Flu} = 1) \times P(\text{Fever} = 1 | \text{Flu} = 1) \\ = 0.5 \times 0.5 \\ = 0.25.$$

Selected Score	Unselected Score	Del
1	0	<input type="checkbox"/>

What Coursera Does, 5

- Offers a range of sophisticated “auto-grading” options
- Any “structured output” document that can be uploaded to site
 - Technical formats: Matlab, R, xml, etc
 - Standard formats: Microsoft Excel spreadsheet. XLS. Text. Etc
- “Validated” peer grading ecosystem
 - Course owner provides test problems and solutions
 - Coursera site asks for volunteer graders
 - Student grades and submits test problems; site decides who is capable and who is not
 - Validated volunteers TAs grade peer assignments; typical assignment gets 6-7 grades, “average” to get final score
 - Coursera asserts their experimental results (controlled experiments?) show this is better than usual in-class TAs

What Coursera Does, 6

- Provide on-line communities, blogs, for student interaction

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Stanford University
Probabilistic Graphical Models Daphne Koller
Professor of Computer Science

Home
Video Lectures
Discussion Forums
Problem Sets
Programming Assignments
Assignment Questions
Class Wiki
Edit Subtitles
Lecture Slides
Course Schedule
Course Logistics
Course Information
FAQ
Course Staff
Octave Installation

Forums Course Content / Video Lectures / Difference Between CRF and Naive Bayes

Course Content / Video Lectures – Difference Between CRF and Naive Bayes

Bayes × CRF × naive × Add Tag

Lock Delete Pin Approve
Unresolve Subscribe

Hi All.
I do not get why for CRF it is about modeling the conditional probability while for naive Bayes, it is about modeling the joint probability and, as a result, CRF is not affected by highly correlated features but naive Bayes is affected. When naive Bayes is used, don't we also only look at the conditional probability?

$$\frac{P(x_1, x_2, \dots, x_n | y)}{P(x_1, x_2, \dots, x_n)}$$

So what really makes highly correlated features okay for CRF?
Thanks!

Posted by Anonymous
on Wed 4 Apr 2012 4:40:46 PM PDT

Time (Oldest to Newest) Time (Newest to Oldest) Votes (Most to Least)

Naive Bayes makes the assumption that the features are independent given the class labels: X_i is independent of X_j given Y . This is clearly a very strong independence assumption that often does not hold true. It is encoded in the basic structure of the graph (since all the X -nodes are connected only to the C node, and not to each other). When we use Naive Bayes to compute $P(Y|X)$, the graph structure mandates that $P(Y|X) \propto P(X_1|Y)P(X_2|Y)P(X_3|Y) \dots$ a far more restrictive expression than the general $P(Y|X) \propto P(X_1|Y)P(X_2|Y, X_1)P(X_3|Y, X_2, X_1) \dots$ if your features are not independent, the structure of the graph, and your factors, will simply be wrong. $P(X_2|Y)$, for example, should be $P(X_2|Y, X_1)$.

On the other hand, the factors in a CRF do not represent conditional probabilities. If our X 's were correlated in a CRF, we would represent it via factors over the X 's: $\phi(X_1, X_2)$, for example. But (this is worth working through yourself) because of the way CRFs are normalized, factors over the X 's alone just cancel out, the correlations don't matter (if you can't figure out why this is, ask, and I can show it in another post).

In summary: Naive Bayes makes strong independence assumptions, and if these assumptions are untrue, the graph structure/conditional probability factors you're using will simply be wrong. But the factors in a CRF do not represent conditional probabilities, and the factors that correspond to correlations between the X 's will simply cancel out. Hopefully this is clear, good question!

Posted by Emma Pierson (Community 1A)
on Wed 4 Apr 2012 9:38:35 PM PDT

Emma is right.
Another way to think about it is that with Naive Bayes classifiers you are trying to determine one class label at a time and each label is independent of the next. (For example, classifying a document based on content to be about "sports" and classifying another document as being about "finance". We're not conditioning the topic of the second document on the first one being about sports.)
With CRFs, like the OCR programming assignment, we can model the likelihood of a sequence of classifications/labels and allow for labels to influence the likelihood of neighboring labels. If we have labeled two characters as being "y" and "n", it is more likely that the third character is "g", for example. CRFs are discriminative Markov Networks (they can have cycles and are undirected). This, in contrast to Naive Bayes DAGs, makes highly correlated features okay.

Posted by Jonathan Russell (Community 1A)
on Wed 4 Apr 2012 10:57:58 PM PDT

What Coursera Does, 7

- Provide online community video conf for participants
 - Example: Stanford Game Theory course

YouTube

Game Theory Online: Screenside Chat: April 6, 2012

Yoav Shoham + Subscribe 2 videos

36:25 / 36:35

Coursera Business Model: Overview

- Coursera does **NOT** own the content, the “IP”
 - Quote: “We take no position on whether this is owned by the academic institution or faculty creators; we don’t own it”
- Coursera has **12 (!)** separate monetization strategies
 - They say: No ads, not ever.
 - Course is always free, ie, you want to just “watch it and do it”
 - But Coursera will monetize other services around courses
 - Each new course gets to select which biz models (monetization strategies) they want use
 - **Coursera shares this \$\$ revenue with content providers of courses they host**

Coursera Monetization Strategies

- **“Freemium”:** pay for certification credential
 - You take the course for free.
 - But if you want the piece of paper which says “Took class and passed with distinction”, costs \$\$\$. Probably \$20-50
- **Virtual registrar:** pay for a transcript
 - Assumption is, in future, people will take many such courses
 - Use these as a way of differentiating their skills, eg, if your college degree is from non-elite institution
 - Pay for transcript at any physical school—same for Coursera

Coursera Monetization Strategies, 2

- **Recruitment: allow job search from LinkedIn, etc**
 - Students can **opt in** to these job searches
 - If somebody on LinkedIn (they are in negotiations) finds you, LinkedIn pays Coursera, Coursera shares revenue
- **Course reuse: Community colleges**
 - Says Coursera: Community colleges have difficulty finding teachers with skills for advanced topics
 - Coursera will license their courses for somebody to “facilitate” locally, on site
 - Idea: schools can offer more/better courses, with fewer staff, at a better price point; they save money, Coursera makes money

Coursera Monetization Strategies, 3

- **Book revenue share**
 - Require or suggest a book for your online course
 - List book via a link to Amazon.com
 - If student buys book from Coursera website link, Amazon offers Coursera 15% of book price
 - Coursera shares this revenue
- **...and about 6-7 more such monetization strategies**
 - Says Coursera: We're not yet sure which ones will work...

Coursera Business Model: Summary

- Courses are free to view, but monetize related services
- Coursera runs everything about the course for us
 - They host it on their computers
 - We specify how long (time period) to keep it up
 - Aside: all courses must have finite lifetime on Coursera
 - (We can pull out at any time – see contract)
 - Coursera will, quote: “run it, launch it, market it” for us
- Revenue sharing model
 - **15% of topline revenues + 20% of gross profits to us**

Coursera Claimed Advantages, 1

- **Silicon valley startup culture**
 - Small, nimble, aggressive, big \$\$ from top-tier VC
- **First mover advantage**
 - They've been doing this for a few years, they know what the problems are, and are aggressively delivering solutions
- **Size**
 - With a big partner ecosystem and many classes, advantages in negotiating deals, eg with Amazon
 - Also: better negotiation with content providers for things like **Copyright** access

Aside: Two Big “Gotcha” Issues in this Space

- **Copyrighted materials**
 - We have clear “fair use” legal framework for material we use inside our physical classes
 - We can show small samples of things, we can pay for rights to copy a paper or book chapter, we pay for rights for students to access papers from prof societies inside illinois.edu
 - All bets are off when we propose to make these material freely available to 100,000+ random folks outside our school
- **At Stanford, there is now scrutiny of all classes for copyright issues; some classes in current form cannot go online, because of use of these materials**

Aside: Two Big “Gotcha” Issues in this Space

- **ADA accessibility**
 - Even if we don't know that any online taker requires a disability accommodation, we must accommodate-first, or risk legal liability
 - Example: what if your online taker is blind? Must offer course in closed-captioned version, and must also describe any diagrams in English text
- **At Stanford, all the online classes are now adhering to these accommodate-first rules, to avoid any legal difficulties**

Coursera Claimed Advantages, 2


- **Free use of the platform *inside* UIUC**
 - If we are an official partner, we can use all the technology for our own on-campus classes, for free
 - Video course delivery, inline quizzes, auto-grading, community blogs, etc etc
- **Regarded as a “perk” for being a Coursera partner**

Aside: Another Potential Coursera Advantage

- Their partner ecosystem consists largely of schools we regard as our direct peers, i.e., perhaps this is a *very good neighborhood* to be in...

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What Coursera Requires of Partners

- **A legal contract**
 - A “term sheet” in VC parlance.
- **A serious level of commitment to do courses online**
 - A set of classes associated with the partnership agreement
 - A set of committed instructors, associated with these
- **Aside: Many faculty across UIUC expressing interest**
 - Several courses & instructors in CS, ECE already interested
 - So too in LAS, I am told

What are the Alternatives to Coursera?

- **MITx/edX appears to be main competitor**
 - Coursera seems to regard them as such
 - MITx/edX claim to be building open, scalable platform for MOOCs
 - But as of now: just one, single MOOC
 - In contrast to Coursera, which has 40+ classes
 - Appears to be not-for-profit enterprise
- **Issues**
 - Prior experience with partnerships here suggests this will be a *strongly* MIT/Harvard branded platform. May be tough for UIUC to breakout in such a circumstance
 - Not really a fully fleshed out platform there, just an aspiration to create a big, scalable MOOC platform
 - No real partnership model, mechanisms in place yet

Aside: Why Not Build Our Own Platform?

- **Yes, we are smart enough**
- **No, we probably don't have the time**
 - Many of our peers are moving forward rapidly and immediately to develop courses on existing platforms
 - Delay could damage our ability to gain visibility, and learn necessary lessons about how to do MOOCs well
- **No, we probably don't have the money**
 - Coursera: \$16M initial VC invest, plus Stanford support
 - Udacity: Unknown initial invest, but top VCs; prob \$10M+
 - MITx/edX: \$60M total invest from MIT + Harvard
 - Minerva Project: \$25M initial VC investment

Where Are We: Quick Recap

- **Our peers are moving rapidly into MOOC universe**
 - Stanford, MIT, Harvard, Michigan, Penn, Princeton, Berkeley, GA Tech...
- **MOOC platforms are becoming available to allow strong schools to offer MOOCs easily, globally**
- **UIUC has nothing in this space (yet)**
 - No MOOC platform(s) in development
 - No MOOCs organized and delivered