

MOOCs and other “faster horses”

Jörn Loviscach

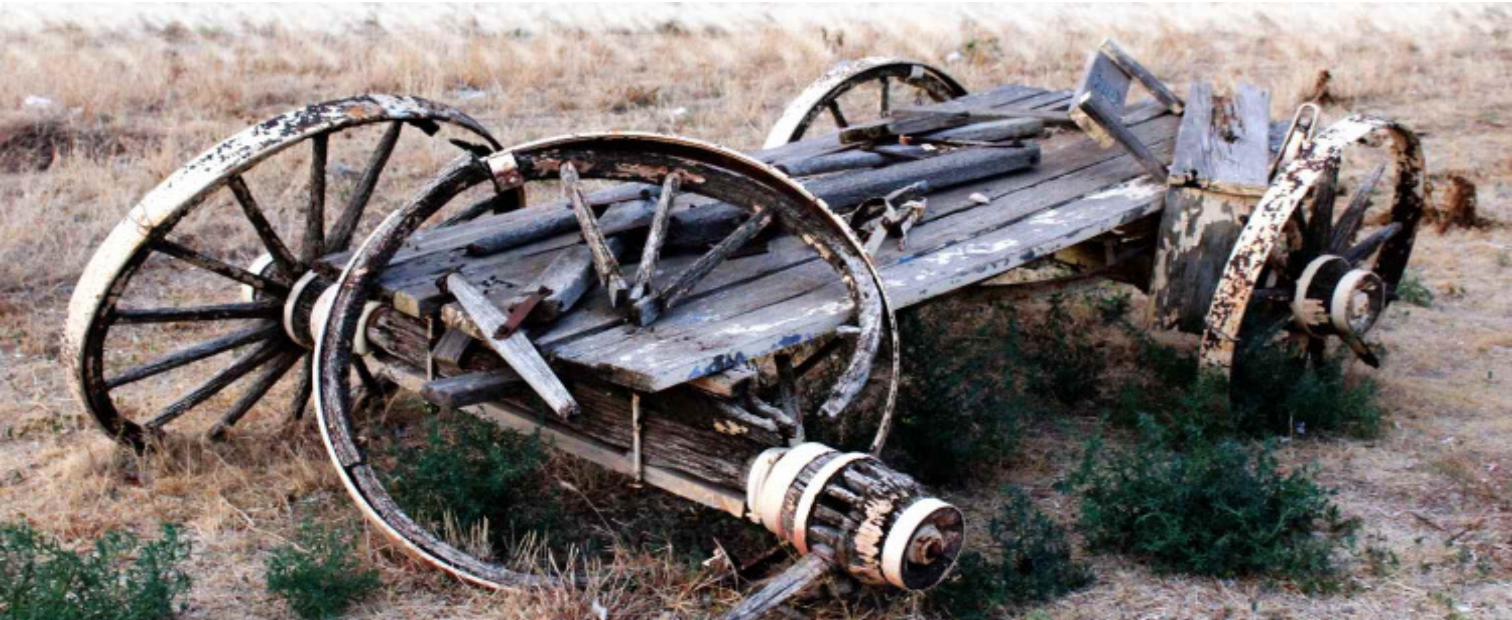


FH Bielefeld
University of
Applied Sciences

2

***“If I had asked people what they
wanted, they would have said
faster horses.”***

Attributed (mistakenly?) to Henry Ford









London School of Journalism, 2009
http://youtu.be/E_eB6-Jrm3M

Who Am I?



in Stellenmarkt

ct

magazin für
computer
technik

H 8752
DM 5,-

Backup-Lösungen
Daten fu

Mit wenig Aufwand op
Typische Fehler beim

Homebanking
Das bieten deut

Bürgernähe per Web
Surfen statt Be

BeOS für Inte

Linux-Einstie

Software-Praxis
Multithread

Der Navig

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Vom Zweitreechner bis zur Bürolösung

PCs selbst vernetzen

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Kombis mit Mankos

Wechsler, Jukebox, CD-ROM-Server
Hunderte CDs im Zugriff

Auf die Software kommt's an
Audio-CDs brennen
Bilddateien verwalten



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16

3



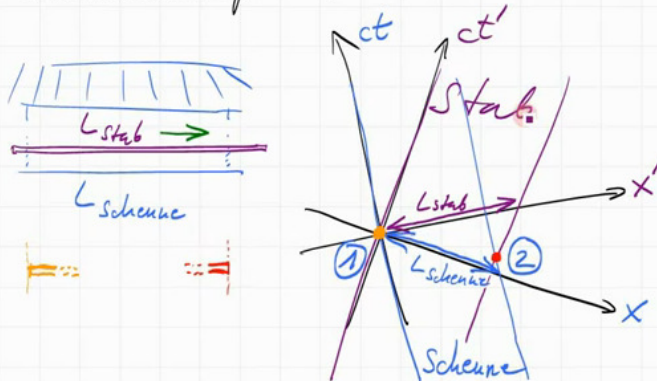


Angesagt

Videos ansehen

Im Kanal suchen

Scheunenparadoxon



10:29 / 19:12

Längenkontraktion; Relativität der Gleichzeitigkeit

von Jörn Loviscach vor 1 Tag

191 Aufrufe

Vorgestellte Playlists

Hochgeladene Videos

2.140 Videos

Mathe 1 Teil 1, Winter 2010/2011

Vektoren, Mengen, Logik, Funktionen, Kombinato...

189 Videos

Mathe 2, Sommer 2011

Vorlesung für B.Eng. Regenerative Energien: Lin...

92 Videos

Jörn Loviscach
 Impressum: <http://www.j3L7h.de/imprint.html>
 Vernünftige Suchfunktion:
<http://www.j3L7h.de/videos.html>

jl <http://www.j3L7h.de/videos.html>

f Facebook

von Jörn Loviscach

Land

Deutschland

Inverted Classroom Model

- Students work with videos before class
- Face-to-face time devoted to practicing and discussing

Differential Equations in Action



UDACITY



Intermediate

INSTRUCTORS

Jörn Lovisoch

Miriam Swords Kalk

Take the Class

Class Summary

In this course you will examine real world problems -- rescue the Apollo 13 astronauts, stop the spread of epidemics, and fight forest fires -- involving differential equations and figure out how to solve them using numerical methods.

What Should I Know?

You'll need a basic knowledge of programming for this course, around the level of CS 101 or equivalent. You'll also need to understand trigonometry at the high school level, as well as basic vector algebra. This class will primarily involve solving equations numerically rather than analytically, but some exposure to calculus and physics at the level of PH 100 wouldn't hurt.

What Will I Learn?

By the end of this course, you'll develop an intuition for the use of differential equations in the applied sciences. You'll also learn how to build mathematical models for systems of differential equations. Along the way, you'll learn how to translate mathematical expressions into Python code, and solve some really cool problems!

Course Instructors

Jörn Lovisoch

Instructor



xMOOC

- Video lectures interspersed with automated quizzes
- Automated homework & exams
- Forum

- Free of charge
- No formal requirements

xMOOC =
PPT + MC + ϵ · Web 2.0

Is that it?

**Does
It
Make
Sense?**





To open door

**Door
unlocked**

1.

Wait for 'Door
unlocked' sign
above door



2.

Lower window



3.

Open door using
outside handle

Lecture, Practice, Homework?

Lecture, Practice, Homework?

„Ich bestimme, dass an allen höheren Lehranstalten die Dauer der Schulstunde allgemein auf 45 Minuten festzusetzen ist.“

August von Trott zu Stolz, 1911
(Secretary of Education, Prussia)

Lecture, Practice, Homework?

- Still the same pattern
- But shorter lectures:
 - 15 min. (Coursera & others)
 - 2-3 min. (Udacity)

Lecture, Practice, Homework?

Explaining is like stealing.

Can we explain without stealing?

Lecture, Practice, Homework?

Socratic approach?

The image shows three overlapping elements related to the Rosalind.info website:

- Top Right:** A screenshot of the 'Problems' page on Rosalind.info, showing a tree-like structure of problem links.
- Bottom Left:** A screenshot of an article titled 'Protein Translation solved by 1722'. The article discusses the genetic code, the discovery of messenger RNA (mRNA), and the process of translation. It includes sections for 'The Genetic Code', 'Problem', 'Sample Dataset', and 'Sample Output'.

The Genetic Code

Just as **nitrate ions** carry negative charges, **amino acids** are relatively smaller molecules that carry positive charges. In this sense, DNA's coding system is simply looking for the **amino acid** that fits the **nitrate ion** of a particular codon. The amino acid that fits the **nitrate ion** is called the **amino acid** that fits the **nitrate ion**.

Protein synthesis proceeds fundamentally not by the cell, but by the **ribosome**. The **ribosome** is a large complex of several molecules that work together to assemble proteins. The **ribosome** is made of two subunits, one large and one small. The **ribosome** is made of two subunits, one large and one small. The **ribosome** is made of two subunits, one large and one small.

Problem

The 20 commonly occurring amino acids are abbreviated by using 20 letters from the English **alphabet** (all letters except for B, J, O, U, X, and Z). **Protein strings** are constructed from these 20 symbols. Here, each of the **amino acids** is represented by a letter from the **English alphabet**.

Sample Dataset

```
AUGCCGAGUGGCGCCGACGACACGAGAACGAUGGACCGCCGUAUACAGCGGUGA
```

Sample Output

```
MANVPIETWVSTRENG
```
- Right Side:** A large, complex network diagram consisting of numerous black circular nodes connected by thin black lines, representing a graph structure.

<http://rosalind.info>

Lecture, Practice, Homework?

- Discovery learning
- But: can't invent STEM from scratch
- Scaffolding required!

Drowning in the Masses?

A large, tiered lecture hall filled with students sitting at desks, looking towards the front. The room has red walls and a large screen on the right side. The students are diverse in age and appearance, and many are looking towards the front of the room. The desks are arranged in a tiered fashion, and the overall atmosphere is that of a busy academic setting.

Mario Habenbacher [manipulated], CC BY 2.0

http://www.flickr.com/photos/neo_ii/4050922108/

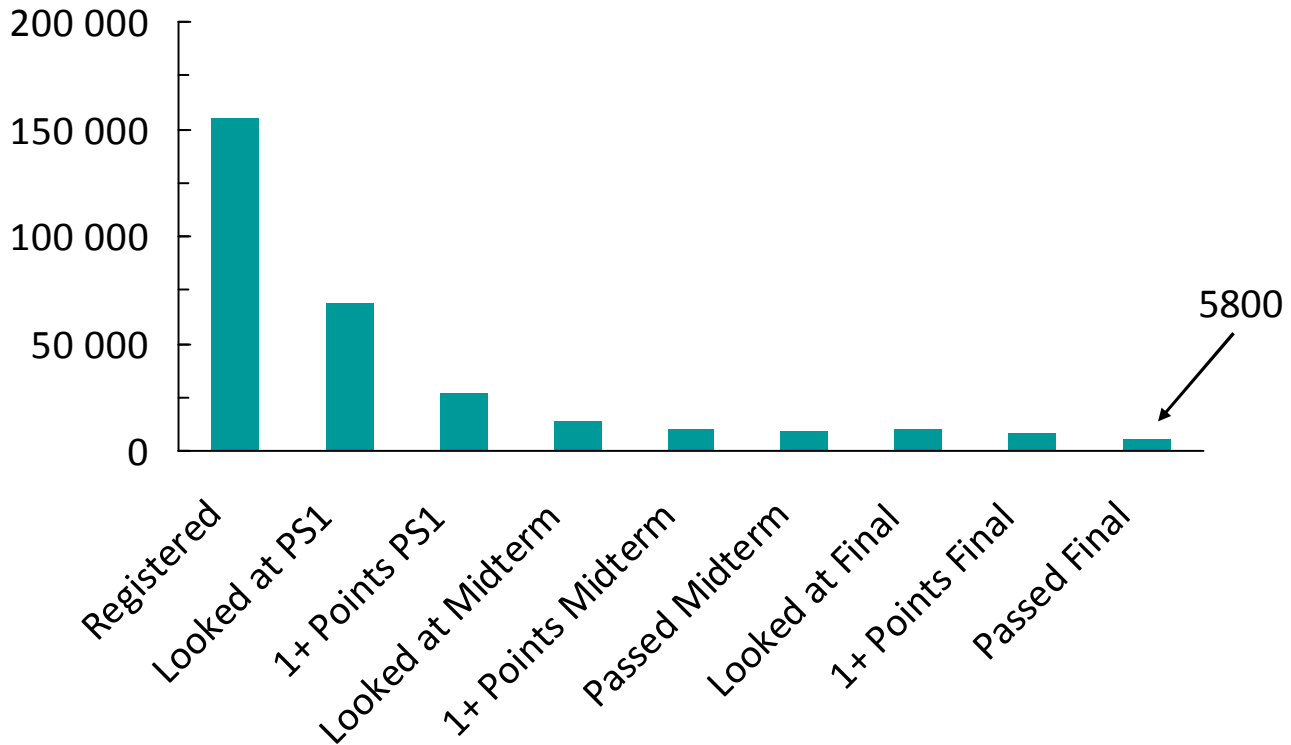
Drowning in the Masses?

- Few users post messages on the forum.
- Most don't even *look* once.

Drowning in the Masses?

- Are the instructors or teaching assistants available on the forum?
- Mean / maximum time to take care of (\neq answer) a question in a *substantial* way?

Drowning in the Masses?



MITx 6.002x: Circuits & Electronics

Data: <http://tech.mit.edu/V132/PDF/N34.pdf>

Drowning in the Masses?

Underused:

- Ask when stuck
- Learn by teaching

2 Answers:

1 Remember that we are working with partial derivatives. In regard to time, it is the first derivative.

2 $T(x) = T(0) - h \cdot T(x)$

3 But if you recall unit 6 ("Central Difference Derivatives") and unit 8, Professor Lehmann's demonstrated that the derivative of the temperature in relation to time is proportional to the second derivative of the temperature in relation to space.

In a way, he checked a little bit (I'm not saying that I dislike the demonstration or that I could do this in a better way, I like the student approach as a matter of fact). He did the demonstration by comparison. First he showed in an intuitive way how the temperature changes along the wire in unit 4 ("Hot Wire").

Heat Conduction in a Wire

$T_0(x) = T_0(0) + h \cdot \frac{10}{40.5} \cdot (T_0(0) + T_1(0) - 2T_0(0))$

$T_1(x) = \frac{10}{40.5} \cdot (T_0(0) + T_1(0) - 2T_0(0))$

Then in unit 6 he showed that the second derivative of a function in relation to space (using central limit, which is a numerical approximation for a derivative) is:

$$f''(x) = \frac{f(x+h) - 2f(x) + f(x-h)}{h^2}$$

Please note that this is the second derivative in relation to space, not time!

The central limit can be applied to any function, including $T(x)$, so:

$$T''(x) = \frac{T(x+h) - 2T(x) + T(x-h)}{h^2}$$

Finally by comparison, he concluded that the $T_1(x) - T_0(x) - 2 \cdot T_0(x)$ term was in fact the second derivative of the temperature in relation to space multiplied by a constant.

Heat Equation

The Heat Equation

$$T_0(x) = T_0(0) + h \cdot \frac{10}{40.5} \cdot (T_0(0) + T_1(0) - 2T_0(0))$$

$$\frac{10}{40.5} \cdot (T_0(0) + T_1(0) - 2T_0(0)) = \frac{10}{40.5} \cdot T_0''(0)$$

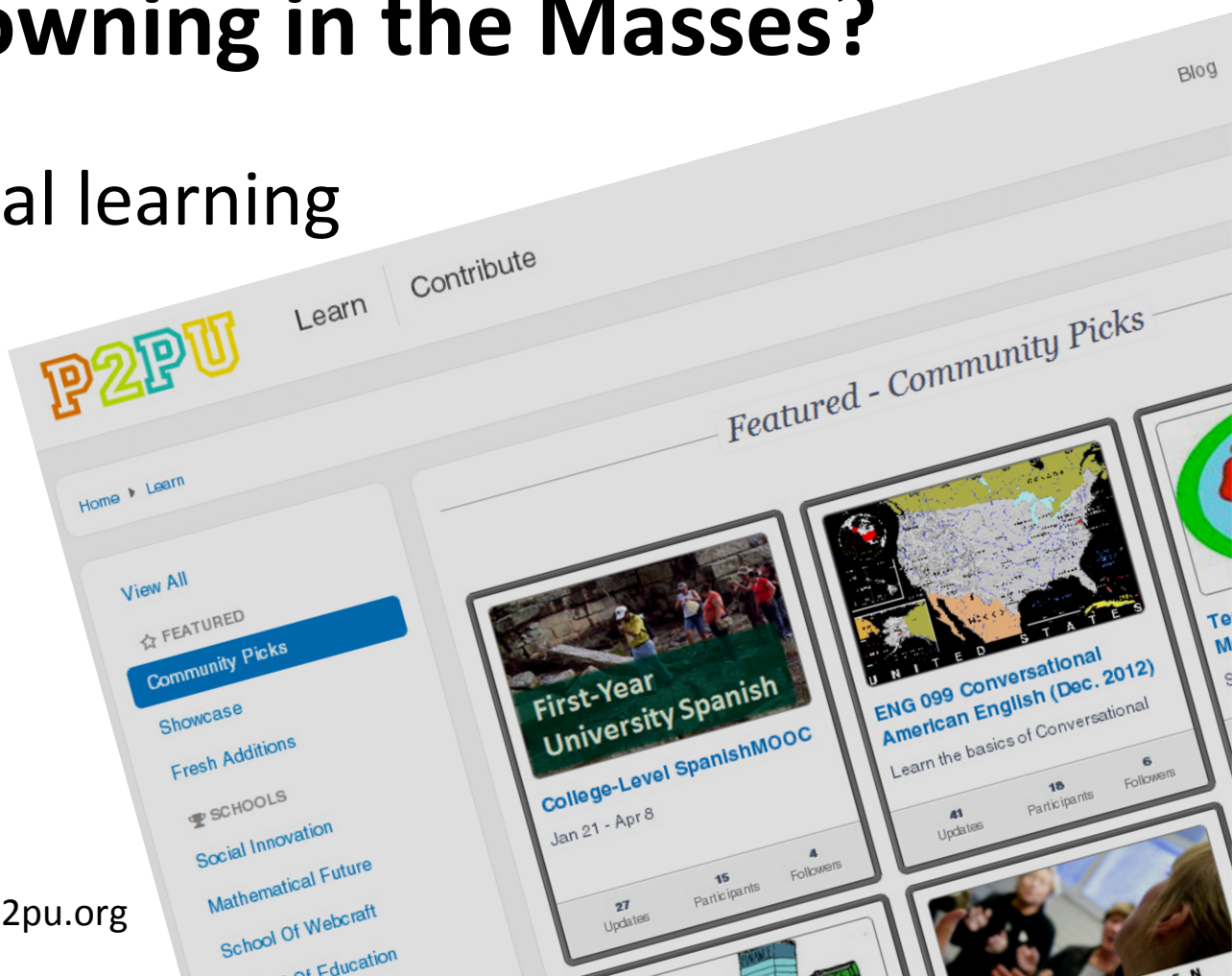
$T_1(x) = \text{constant} \cdot T_1(x)$

<http://forums.udacity.com/questions/15001469/>

formula-for-heat-equation-in-6-11#cs222

Drowning in the Masses?

Social learning



<http://p2pu.org>

Deadlines?

- **Less procrastination**
- **More focused discussions**
- **Higher media impact**

Deadlines?

- Excludes users with daytime jobs, caregivers
- Excludes users who need to brush up pre-requisites
- Pressure
(detrimental to deep learning)

Deadlines?

- Mastery learning
- Customized deadlines

Cut and Dried?



Taijo Fujii, CC BY 2.0

http://www.flickr.com/photos/t_trace/2324550892/

Cut and Dried?

- Lots of stuff taught because it's in the books.
- Lots of stuff **not** taught because it's **not** in the books.



Cut and Dried?

Tell a story!

- Unit 1 - Houston We Have a Problem**
- Unit 2 - Houston We Have a Solution**
- Unit 3 - Contagion**
- Unit 4 - Responsible Fishing**
- Unit 5 - Antilock Braking Systems**
- Unit 6 - Wildfire**
- Unit 7 - Advanced Applications of Numerical Methods**

Cut and Dried?

Touch whichever subject is needed

Welcome • Two Types of Friction
Will It Stay • Wheel Slip • Stop Time
Computing Mu • Braking Equations
Wheel Slip Equilibria • Calculating Slip
The Big Idea • Pumping the Brake
Controlling Slip • P Controller
Hydraulic Brakes • Estimating Velocity
Further Complications • Torque
Psychology • Conclusion

Physics

Mathematics

Numerics

Sensors

Control theory

Psychology

Cut and Dried?

- Problem-based learning
- Project-based learning

Low Expectations?

- “Disengagement Compact”
(George Kuh)
- Low expectations & little scaffolding
→ poor outcomes

Low Expectations?

Evening classes
or university-level
education?



The screenshot shows the Google Inside Search website. At the top, the Google logo is followed by 'Inside Search'. Navigation links include Home, Tips & Tricks, Features, Search Stories, Playground, Blog, and Help. The main heading is 'Sharpen your search skills' with a sub-heading 'Join a free course to help you become a better searcher'. Below this, a paragraph states: 'Knowing how to find answers on Google is an important skill in today's digital age. Taught by Google's Search experts, this online class will help you search smarter, so you can find the information you need — even in the most challenging situations.' A blue 'Register' button is visible. To the right, there is a search results interface for the query 'orange' with a color selection tool overlay. The tool has options for 'Any color', 'Full color', and 'Black and white', each with a grid of color swatches. Below the main text, there is a video thumbnail showing a man with glasses and a beard sitting at a desk with a laptop. To the right of the video, the section 'What you'll learn' lists: 'This is an online, community-based course that will show you how you can use them to solve real, everyday problems. A former research scientist at Google, will cover...'. A bulleted list follows: '• Find just what you're looking for', '• Get right to the most credible sources', '• Solve even the most challenging problems'. At the bottom, there is a 'How it works' section and a note that the course 'ends on October 10. Register now and...'.

Google Inside Search

Home Tips & Tricks Features Search Stories Playground Blog Help

Sharpen your search skills

Join a free course to help you become a better searcher

Knowing how to find answers on Google is an important skill in today's digital age. Taught by Google's Search experts, this online class will help you search smarter, so you can find the information you need — even in the most challenging situations.

Register

Search

orange

Any color
Full color
Black and white

What you'll learn

This is an online, community-based course that will show you how you can use them to solve real, everyday problems. A former research scientist at Google, will cover...

- Find just what you're looking for
- Get right to the most credible sources
- Solve even the most challenging problems

How it works

... ends on October 10. Register now and

<http://www.google.com/insidesearch/landing/powersearching.html>

Low Expectations?

- No-brainer multiple choice tests?
- No quizzes that are puzzling?
- Recipes but no explanations?
- Pseudoteaching
and pseudolearning?
- No time to catch up
→ low prerequisites?

Low Expectations?

(Deep) Learning is arduous,
but discovering and inventing *are* fun!

Flow (Csikszentmihalyi)

A Lone Sage on the Stage?



Piotr Drabik, CC BY 2.0


<http://www.flickr.com/photos/drabikpany/7873494188/>



A Lone Sage on the Stage?


<https://www.udacity.com/course/ma008>

UDACITY
Course Catalog My Courses Jörn Lov

College Algebra





Beginner

Qualifies for accreditation

INSTRUCTORS
 Julie Silva Spitzer
 Miriam Swords Kalk

STARTS JAN 30 2013

Add to My Courses

Class Summary

How on earth are animals, architecture, and business related? You've heard it

What Should I Know?

Basic arithmetic - addition, subtraction, multiplication and division of positive and

What Will I Learn?

In this course, you will learn...

Course Instructors

Julie Silva Spitzer
 Instructor

A Lone Sage on the Stage?

<http://fall12.6003z.amolbhav.in/> July 08

6.003z: Signals and Systems

Courseware Course Info Textbook Discussion Wiki

Login / Register

Course Info

July 16

- From Week 4 onwards, homework assignments also include giving answers in the form of algebraic expressions. The rules of forming the expression are the same as that of 6.002x.
- After the due date of an assignment has passed, the solutions can be found on the same page as the assignment. You can still submit answers after the due date but they won't be graded.

July 11

- A rudimentary version of discussion forum mirror is now available in the right hand side navigation. Previously, only those students who had an account at MITx could access the discussion forum. Now, even those students who lack an account at MITx can access the forum. They can't post questions and comments yet but this functionality is to come in some time. Currently, access is limited to just viewing.

July 08

- Homework deadline for Week 1 has been extended till July 15 due to unavailability of the discussion forum for everyone. Discussion forum will be made available to everyone (including those not having account at MITx) so progress won't appear in the profile section for that problem. You will have to check and Show Answer.
- Ensure that everyone is following at the same pace.

A Lone Sage on the Stage?

Lessons
& instructors
from real life

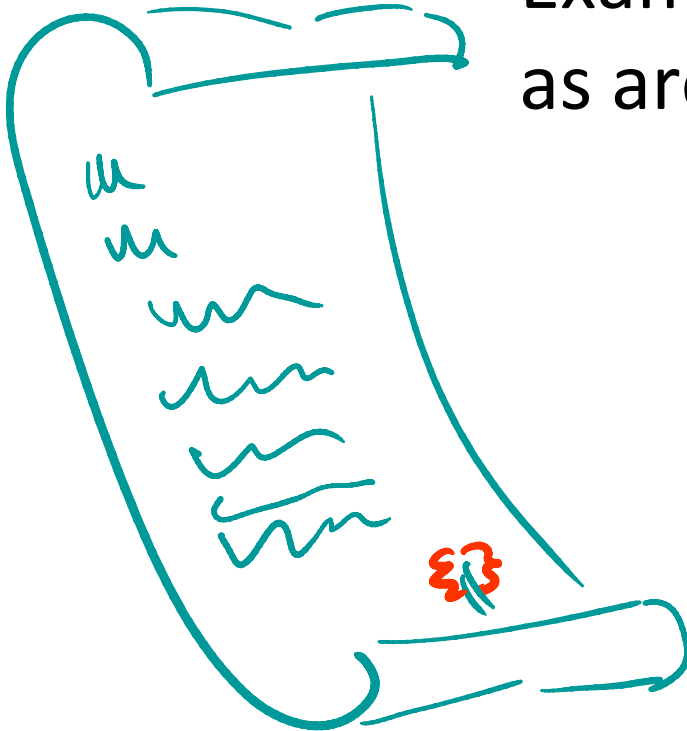


Eric Haines is a Senior Principal Engineer at Autodesk, Inc., working on a next-generation interactive rendering system for computer-aided design applications. He is a coauthor of the book "Real-Time Rendering," a founder and editor of the Journal of Computer Graphics Techniques, and maintainer of the Graphics Gems code repository, among other activities. He received an MS from the Program of Computer Graphics at Cornell in 1985.

<https://www.udacity.com/course/cs291>

Testing, testing?

Exams are graded,
as are certificates.



Testing, testing?

- Grades become more important than what you have learned.
- Extrinsic reward
 - “efficient” shallow learning
- Evasion to “easier” subjects/graders
- Grade inflation
- Cheating

Testing, testing?

- Focus on individual work
- How to test what's important?

Testing, testing?

- Udacity & edX:
proctored exams with Pearson VUE
- Udacity:
exams at San Jose State University
- Coursera “Signature Track”:
typing pattern as biometric marker
- Academic Partnerships:
MOOC2Degree

Testing, testing?

- Formative rather than summative evaluation
- Teaching without a safety net

Testing, testing?

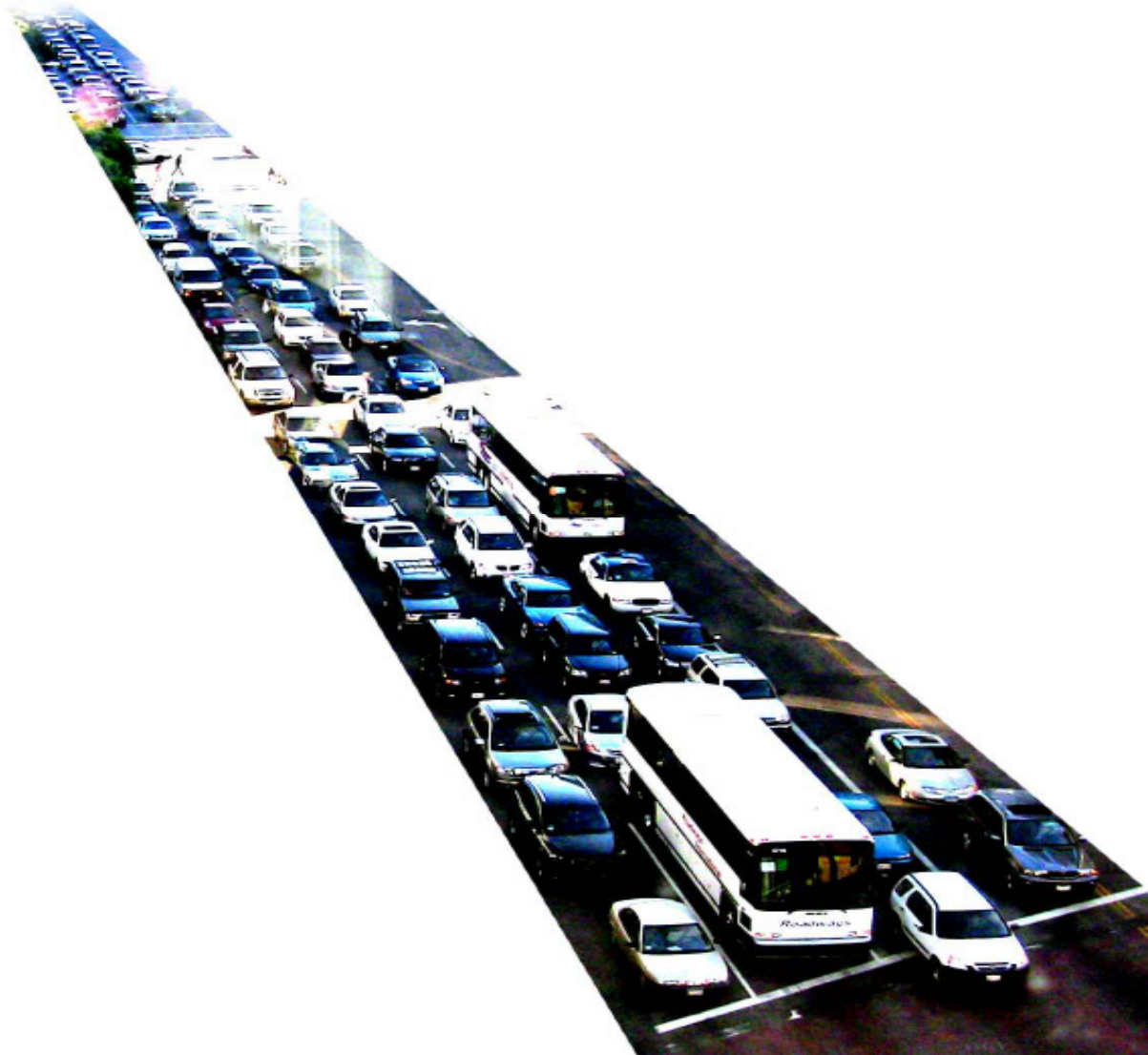
Portfolios



<http://www.udacity.me/>
<http://talent.colum.edu/>





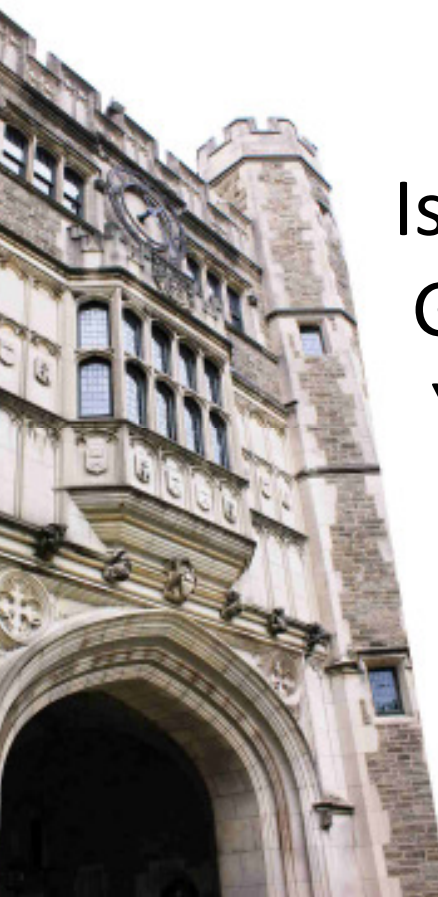


How do I get from A to B?

Why do I want to go to B?

**Is B the right destination
anyway?**

Who Needs Universities?



Is there something that
Google, Facebook,
YouTube, Wikipedia,
Coursera, edX and Udacity
can't do in the long run?

Who Needs Universities?



**What if Google “bought”
Stanford University
and Princeton University?**

Who Needs Universities?

What if educators can do without universities?



<https://www.khanacademy.org/>
<http://www.udemy.com/>

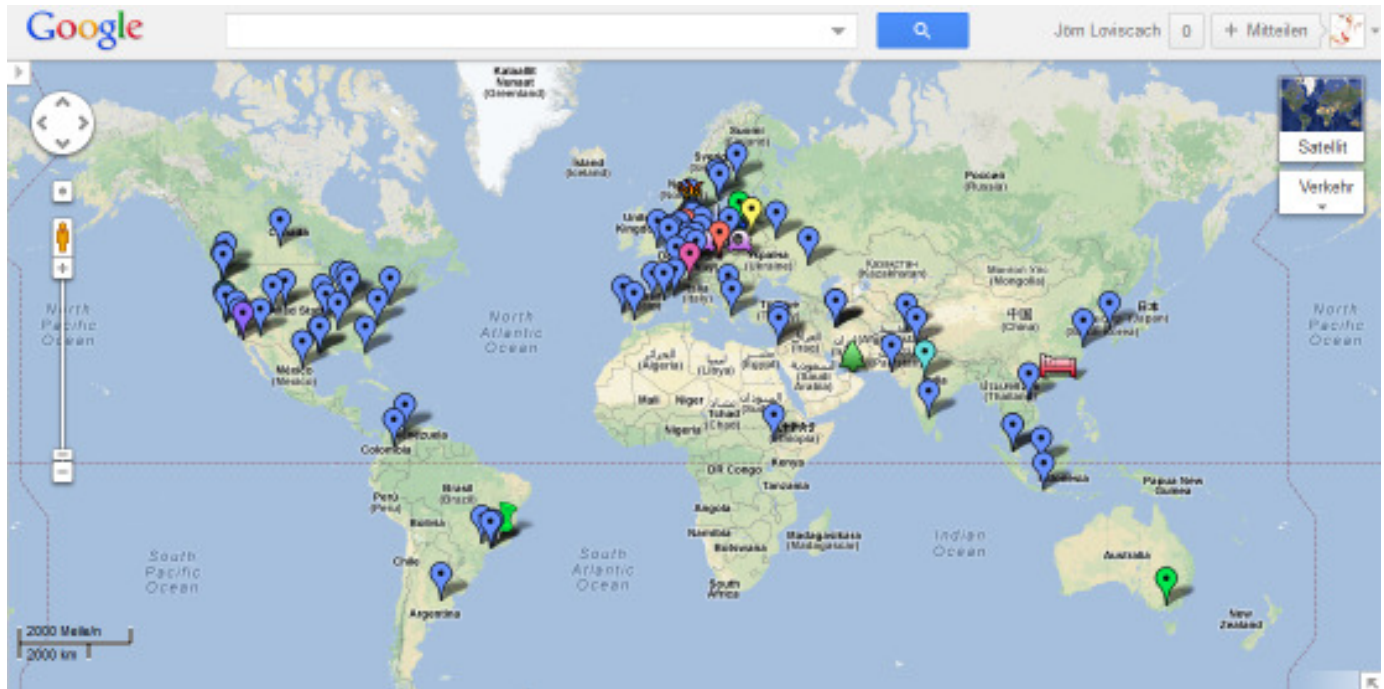
Who Needs Universities?

- What if the pieces are really modular?
- What if the pieces can be remixed* at will?

* The pieces of most current xMOOCs *cannot* be remixed!

Who Needs Universities?

Udacity CS222 Students



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Who Needs Universities?

MOOCs are open to everybody?

Yes, ...

Who Needs Universities?

MOOCs are open to everybody?

Yes, given an internet connection, enough spare time, awareness, interest, motivation, the ability to communicate, an independent mind.

Who Needs Universities?

MOOCs are open to everybody?

Yes, given an internet connection, enough spare time, awareness, interest, motivation, the ability to communicate, an independent mind.

Do schools foster these?

Does society foster these?

Conclusion

- Existing institutions perpetuate their old model.
- New players *could* experiment.
- But often they miss the chance.

Conclusion

- Existing institutions perpetuate their old model.
- New players *could* experiment.
- But often they miss the chance.
- **Will the public take notice?**

It has worked once ...

YAHOO!

Home Mail Finance Sports Weather Shopping Travel Jobs Real Estate Games News Reference Regional Science Social Science Society and Culture

1998 Winter Games NBA - NASCAR - PGA

Valentine's Day Valentine's Day GEEK VALENTINE'S DAY Yahoo! Personals

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