A Qualitative Study of Open Educational Practice using Jupyter Notebooks

@LorenaABarba
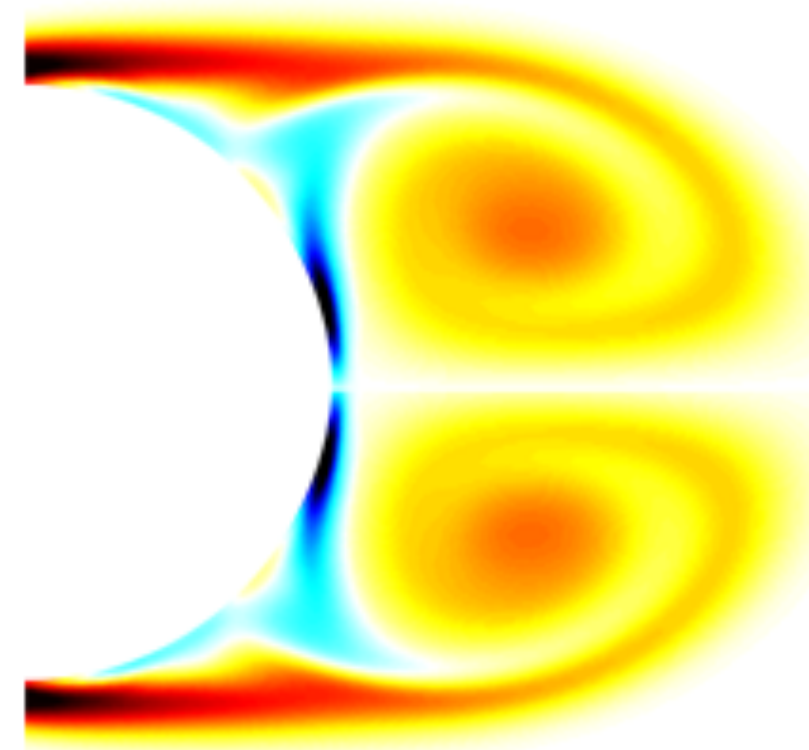
About me

▸ Sharing OER via

- iTunes U, YouTube, TED-Ed

- GitHub

- self-hosted Open edX site

▸ Disseminating via

- Twitter & self-hosted blog

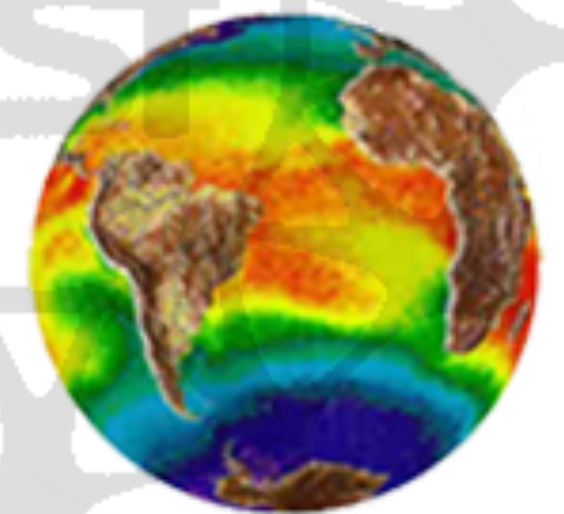http://lorenabarba.com

Fluid Mechanics **BU**

Computational Fluid Dynamics **BU**

Bio-aerial Locomotion **BU**

PASI Scientific Computing in the Americas

Main messages

▸ Open Ed movement was inspired by free & open source software (FOSS).

▸ *features missed*: open development, networked collaboration, community, value-based framework...

▸ **Can open-source ethics and practices be infused via an OS medium like Jupyter?**

History of OER

▸ 2002: "open educational resources" coined — UNESCO Forum.

▸ Others join the OCW movement: Rice, JHU, Tufts, CMU, USU…

▸ 2005: The OpenCourseWare Consortium

▸ 2007: OECD "Giving Knowledge for Free…"

WWW   OCW   OCW Consortium

1990   2000   2010
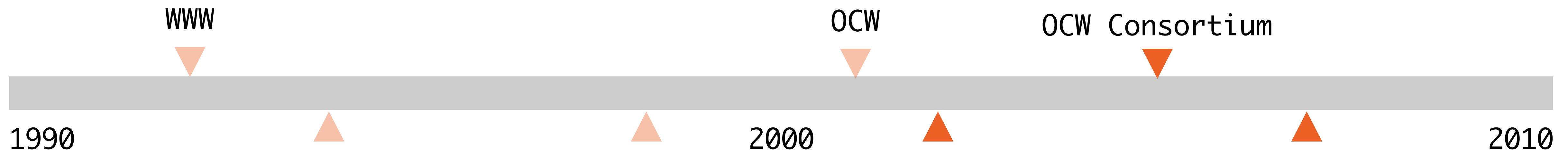
Recurring topics in OER

▸ reducing cost of textbooks for students

▸ increasing access (for worldwide learners)

▸ copyright and licenses

▸ altruism & public good
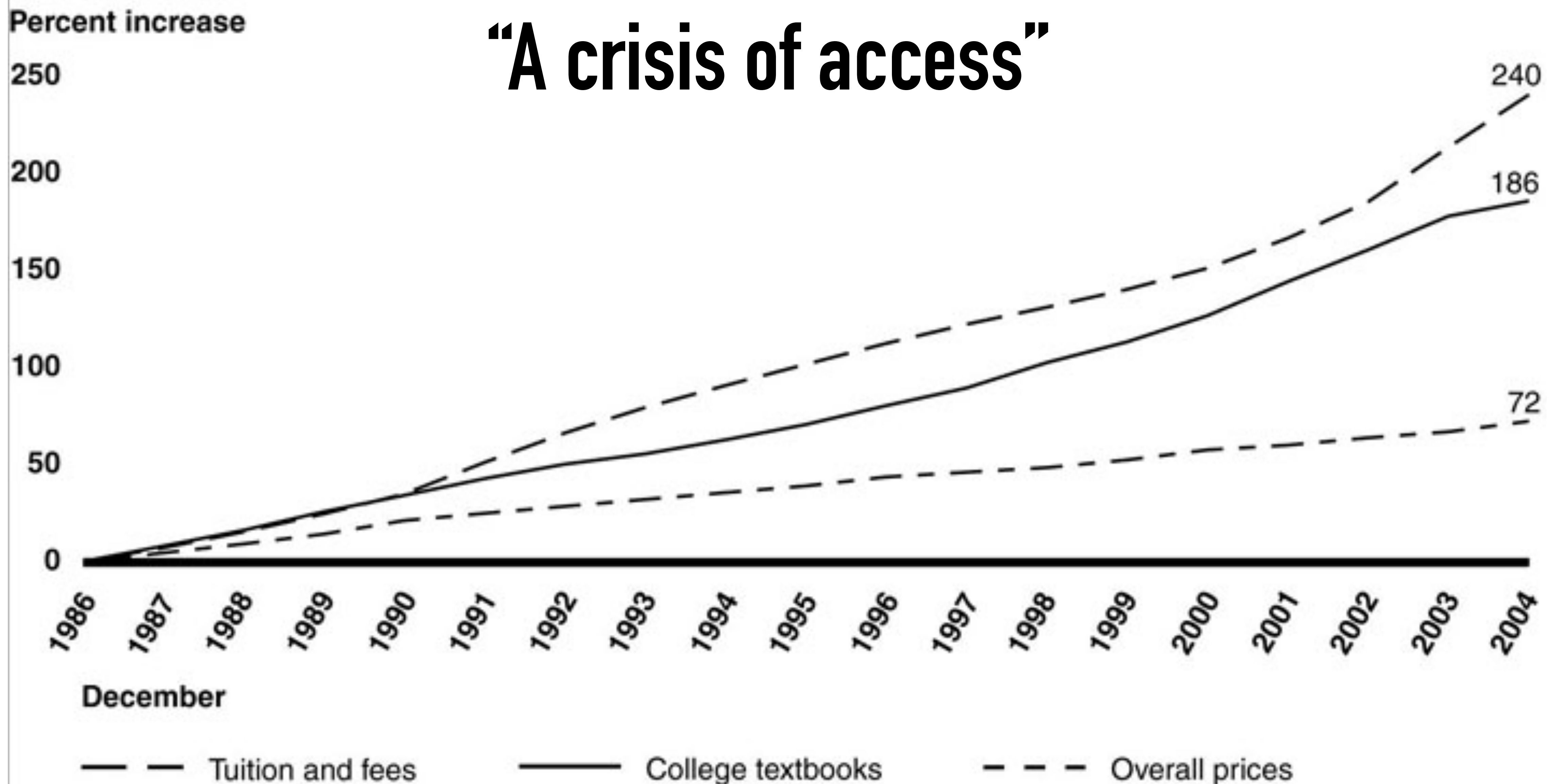
"A crisis of access"

Annual Increase in College Textbook Prices, College Tuition and Fees, and Overall Price Inflation, 1986–2004 (US Government Accountability Office).

Little change in status quo

- 3,000 faculty surveyed on 2016

- 58% faculty not aware of OER

- 5.3% of courses using open textbooks

http://www.onlinelearningsurvey.com/oer.html

What did OER miss from FOSS?

▸ developing in the open

▸ collaborating/contributing

▸ community around OS projects

▸ culture & value-based framework

FOSS: developing in the open

▸ The OER narrative is often about: creation vs. adoption, author vs. user

▸ MIT OCW was never open for contributions.

▸ Rice's Connexions *intended* to be open for contributions, but this feature faded...

Algebra and Trigonometry

Biology

Biology for AP® Courses

Astronomy

Anatomy and Physiology

Calculus

American Government

Principles of Economics

Concepts of Biology

College Algebra

Chemistry

Chemistry Atoms First

Elementary Algebra

Intermediate Algebra

College Physics AP® Courses

Microbiology

Principles of Microeconomics

Principles of Macroeconomics

Principles of Macroeconomics for AP® Courses

Principles of Microeconomics

College Physics for AP® Courses

Precalculus

Psychology

Introduction to Sociology 2e.

Introductory Statistics

University Physics

U.S. History

Prealgebra

We create huge amounts of OER, but there is very little reuse...

— Stephen Downes,
VI International Seminar of the
UNESCO chair in e-Learning (June2010)
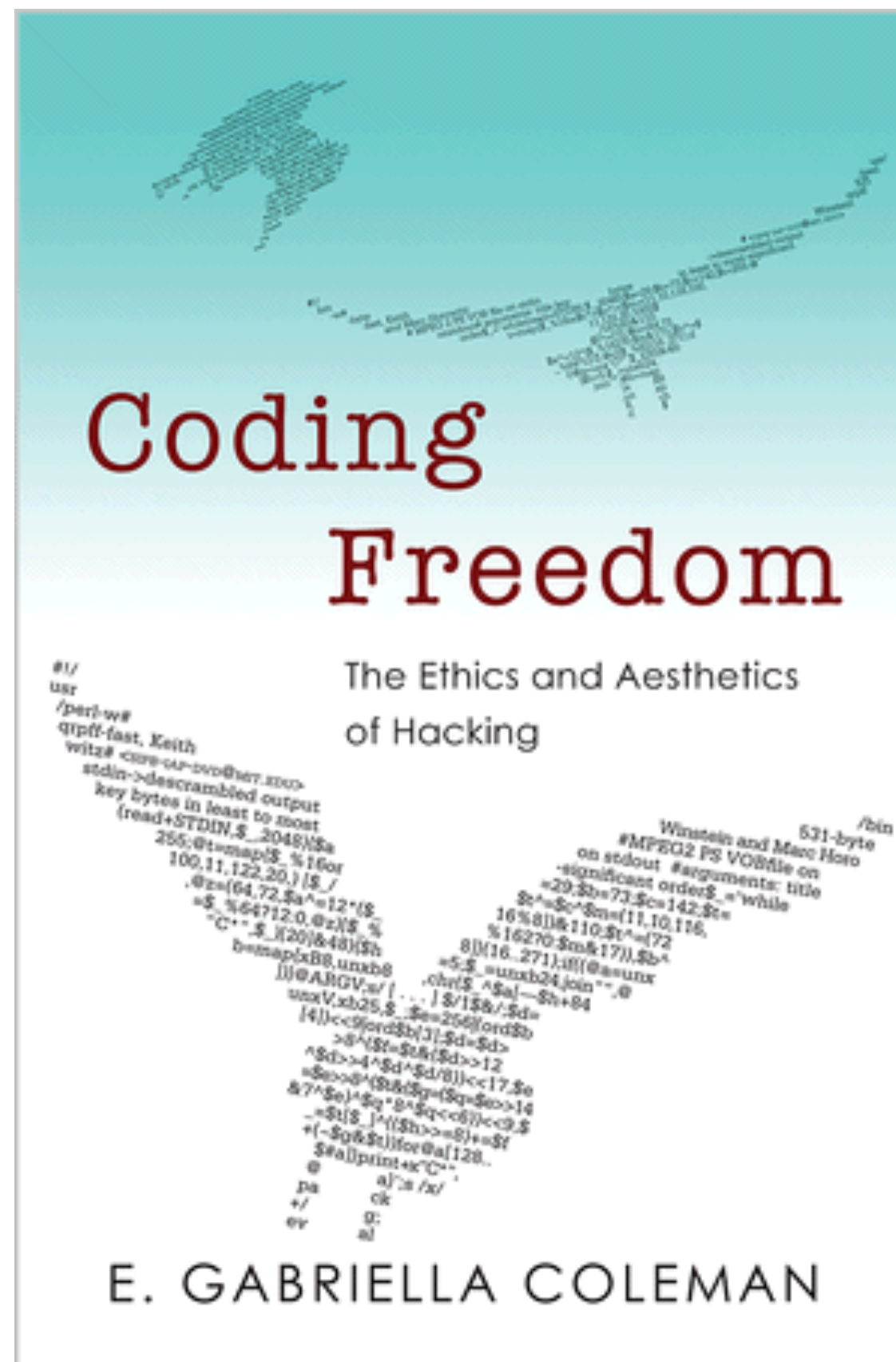
https://youtu.be/AQCvj6m4obM

Openness is about the possibilities of communicating with other people. It's not about *stuff*, what you do with stuff. It's about what you do with each other

— Stephen Downes, 2017

https://youtu.be/FPHYAFcUziA

Coding Freedom

The Ethics and Aesthetics of Hacking

E. GABRIELLA COLEMAN

Open–Source Software projects build institutions that have very strong ethical **commitments**…

(1) freedom of access
(2) transparency
(3) governance

Why Open Education?

Pedagogy of openness—open teaching & learning practices actively promote rich networks, lively communities, and fertile connections.
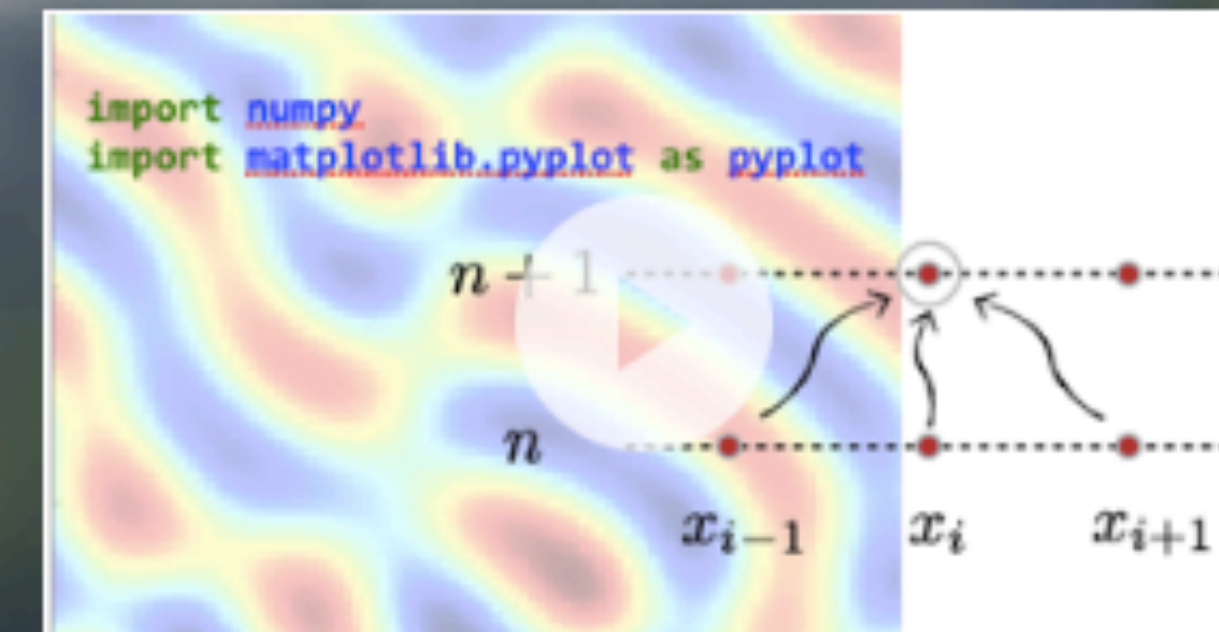
Openness

...serves a pedagogical purpose: learning is richer by open sharing.

Coordination

...in the model of open-source culture, to create value together, fostering innovation & leadership.

https://openedx.seas.gwu.edu

A new genre of OER

A set of open-source tools for interactive and exploratory computing.

Computable content

Educational content made powerfully interactive via compute engines in the learning platform

The course of the future — and the technology behind it

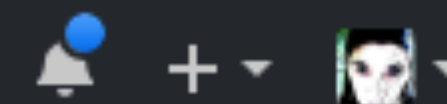Jupyter Notebooks powering Berkeley's data science curriculum

`http://data.berkeley.edu/news/coursefuture`

jupyter / **jupyter**

Watch ⌄ 244   ★ Star 2,646   Fork 591

<> Code   ⓘ Issues 74   Pull requests 0   Projects 0   Wiki   Insights

A gallery of interesting Jupyter Notebooks

Edit   New Page

Andres Soto Villaverde edited this page 15 days ago · 42 revisions

Table of Contents

1. Entire books or other large collections of notebooks on a topic
   - Introductory Tutorials
   - Programming and Computer Science
   - Statistics, Machine Learning and Data Science
   - Mathematics, Physics, Chemistry, Biology
   - Earth Science and Geo-Spatial data
   - Linguistics and Text Mining
   - Signal Processing
   - Engineering Education
2. Scientific computing and data analysis with the SciPy Stack
   - General topics in scientific computing

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✎

Jupyter

- Home
- A gallery of interesting Jupyter Notebooks
- Jupyter kernels
- Jupyter Notebook Server API

Demo:

http://go.gwu.edu/engcomp2lesson2

How Jupyter exercises the 5Rs

▸ Shared under CC-BY + BSD3 (or MIT)

▸ Hosted on GitHub: "fork" or download

▸ Locally interactive and editable

▸ Contribute back via pull-request

Our course's open culture

▸ Jupyter notebooks available on GitHub

▸ JupyterHub: cloud notebook server (no installation friction, equity)

▸ Slack for day-to-day conversation

▸ Open edX for for a MOOC version (WiP)

Hypothesis:

Jupyter, as OER, may also influence students' attitudes and capacities toward sharing and openness

"Engineering Computations"

52 students in the class, 16 answered survey, 6 agreed to be interviewed…

Results

▸ Cultural barrier: expectation of "the textbook"

▸ Other barriers: culture of competition, student maturity

▸ Positive: 8 students wanted to be part of continuing learning community, as mentors

Recommendations

▸ need to thread OEPs through several courses, and start early (can't change culture w/ one course)

▸ need collaboration w/ other instructors to reinforce ideas, skills, attitudes across more than one course

Quotes from interviews:

"I would use Slack whenever I had a pressing question to see if someone had already asked it in the general channel"

"Slack helped me waste less time when doing homework"

Counter points:

"It's confusing and stressful as a student because you feel like you need to be constantly reading the slack channel to ensure you don't get points off"

"30-40 people in slack, same 10 talk all the time, another 10 that occasionally ask questions"

Counter-counter points:

"Slack kept me interacting way more with TAs and professors, if I needed to understand something, someone would be available at any time"

"Not formal like emails, chatting with classmates"

Quotes on Jupyter:

"Made class way more interactive, because you could go back and edit the notebook. If there's something students didn't understand or wasn't clear enough, she could easily go back and add more explanation for a chapter in the notebook"

"Almost like a textbook I could continuously edit"

Quote on open collaboration:

"The fact that it's open really helps. It encourages collaboration with other professors from other Universities, it's cool to see other professors working together, like when a notebook is co-authored by a professor from another university"

Quote on reuse:

"I've started using my old Jupyter Notebooks … in other courses and Labs. When there's a regression I just copy and paste the code and run it in the notebook I've created for that particular class or lab and then edit it for that problem"