Teaching Machine Learning Workshop at ECML 2022

Teaching in the Open:

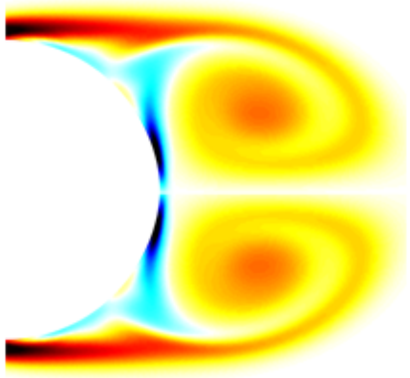
advancing education by adopting open source and open science practices

@LorenaABarba http://lorenabarba.com

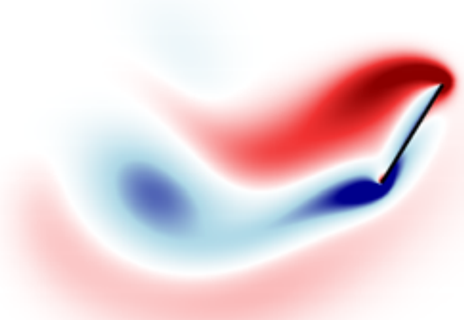
GW SEAS

About me

- Sharing OER since 2008 via
  - iTunes U, YouTube, TED-Ed
  - GitHub
  - self-hosted Open edX site
- Disseminating via
  - Twitter & self-hosted blog



Fluid Mechanics BU

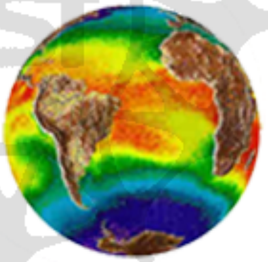


Computational Fluid Dynamics BU

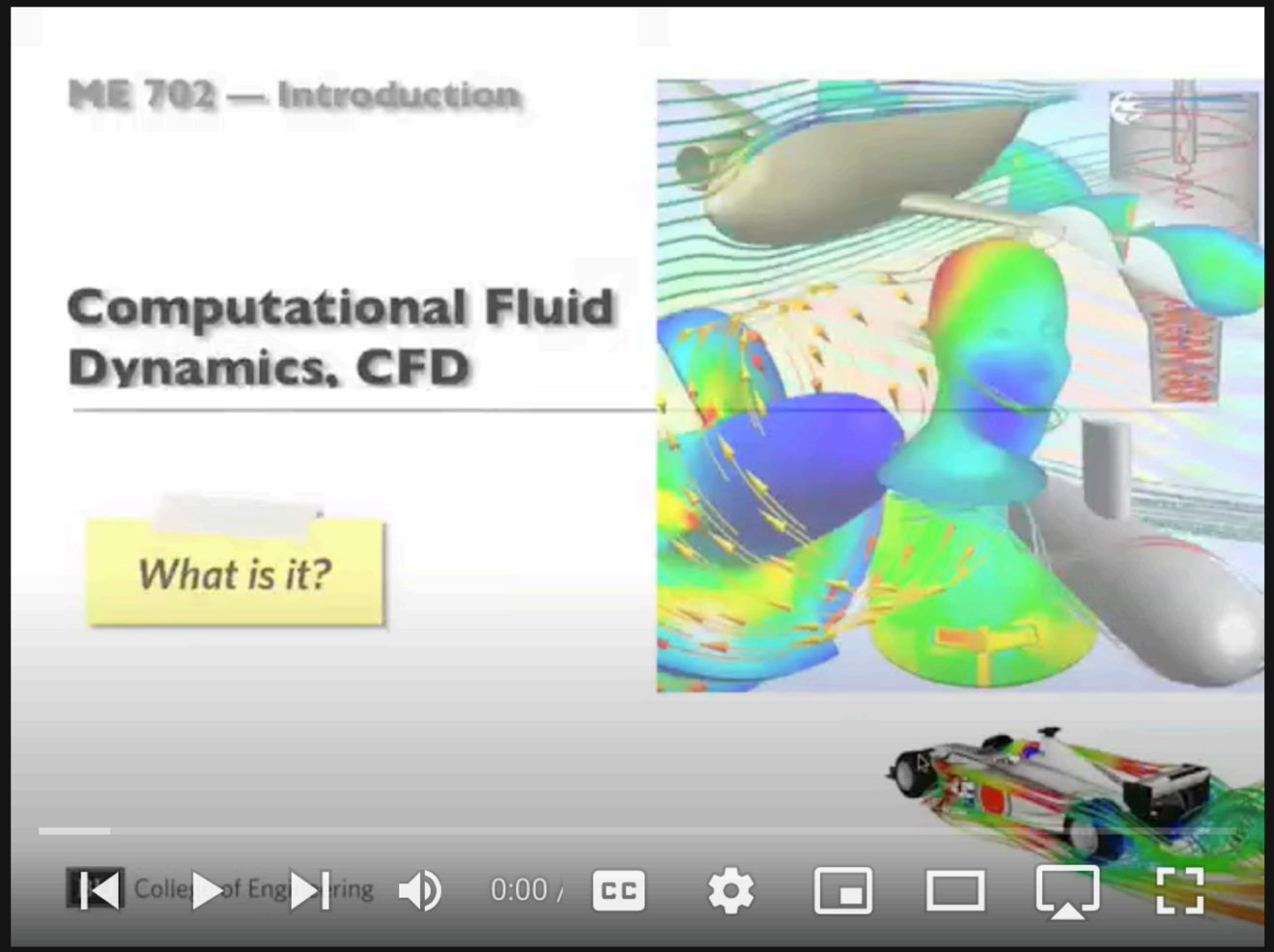
Bio-aerial Locomotion

BU

PASI Scientific Computing in the Americas



http://lorenabarba.com



ME 702 - Computational Fluid Dynamics - Video Lesson 1

163,770 views Jan 22, 2012 NEW ! (August 2014) Prof. Barba is teaching a MOOC titled "Practical Numerical Methods with Python." Check it out ...more

981 Dislike Share Clip Save ...

ME 702 - Computational Fluid Dynamics
Lorena Barba - 1 / 32

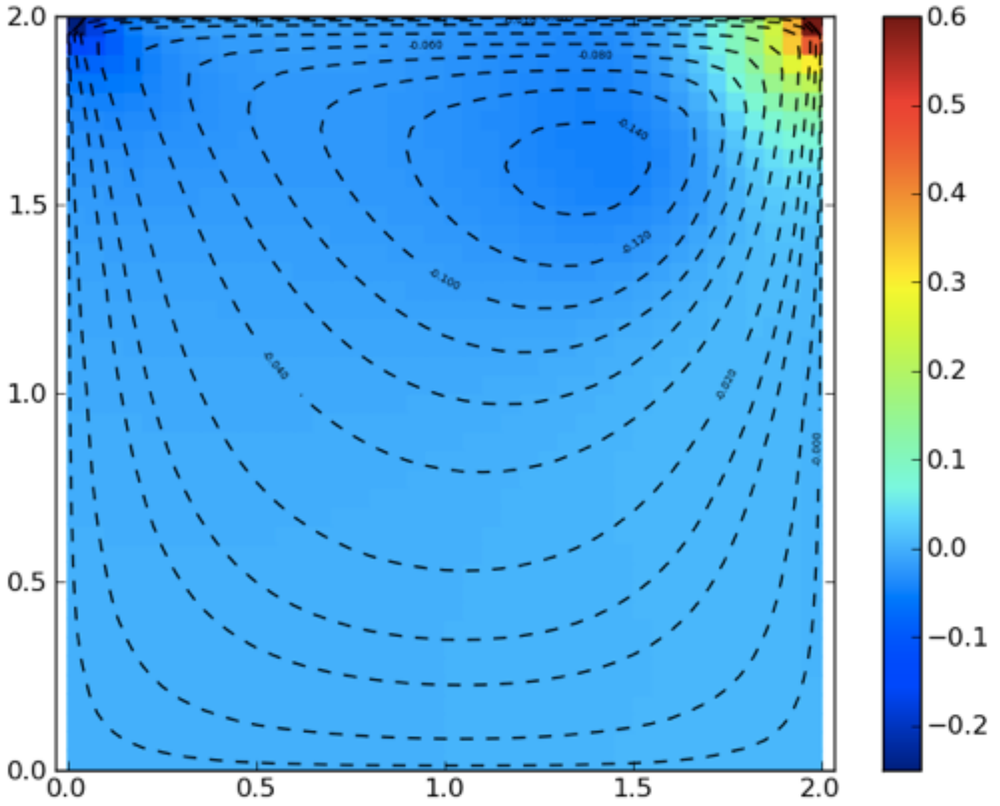
1. ME 702 - Computational Fluid Dynamics - Video Lesson 1 — 33:26 — Boston University
2. ME 702 - Computational Fluid Dynamics (Lecture "zero", par... — 12:48 — Boston University
3. ME 702 - Computational Fluid Dynamics (Lecture "zero", par... — 32:57 — Boston University
4. ME 702 - Computational Fluid Dynamics (Lecture "zero", par...

Added views
~1,053,921

checked 9/07/2022

Lorena A. Barba group

CFD Python: 12 steps to Navier-Stokes



Cavity flow solution at Reynolds number of 200 with a 41x41 mesh.

Posted on 07.22.2013

Lessons

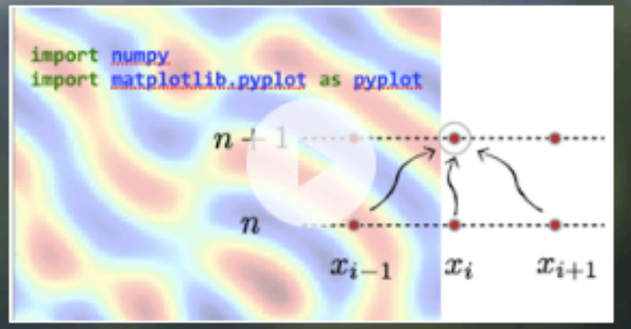
- Quick Python Intro
- Step 1
- Step 2
- CFL Condition
- Step 3
- Step 4
- Array Operations with NumPy
- Step 5
- Step 6
- Step 7
- Step 8
- Defining Function in Python
- Step 9
- Step 10
- Optimizing Loops with Numba
- Step 11
- Step 12

https://github.com/barbagroup/CFDPython

https://openedx.seas.gwu.edu

Practical Numerical Methods with Python

MAE 6286



Start Date:
Sep 1, 2017

Duration:
15 weeks

Price:
Free

Enroll Now

Course Description

This is a first course in numerical methods for advanced students in engineering and applied science. It was developed in 2014, both as a massive open online course (MOOC) and a regular course at the George Washington University. Similar courses have been taught at partner institutions: Southampton University (UK), Pontifical Catholic University of Chile, and Université Libre de Bruxelles. The original MOOC instance stayed online until August 2017, reaching 8,280 registered users.

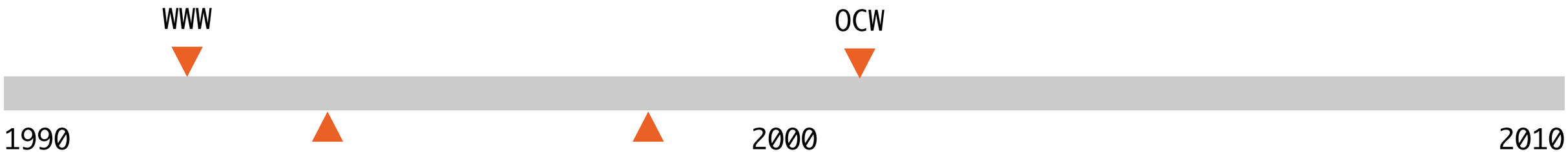
Organization:	GW
Enrollment End:	Dec 31, 2017
Effort:	15 weeks / 6 hours per week
Subject:	Numerical Methods

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 enhance quality and outcomes?**

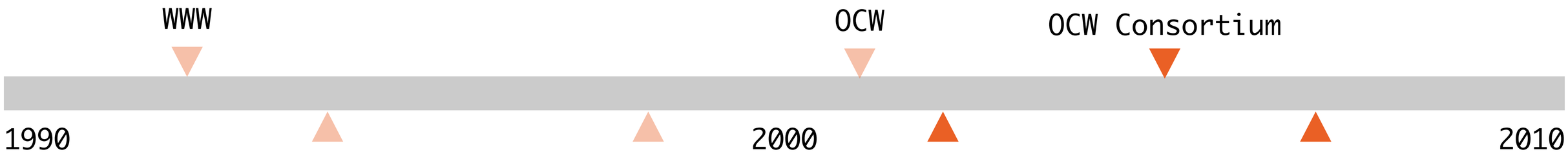
History of OER

- 1994: “learning object” —idea that digital materials can be made to be *reused*.
- 1998: “open content” —idea that principles of FOSS could be applied to content.
- 2001 —founding of Creative Commons
—MIT OpenCourseWare launched.



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…”



Recurring topics in OER

- reducing cost of textbooks for students
- increasing access (for worldwide learners)
- copyright and licenses
- altruism & public good

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…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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

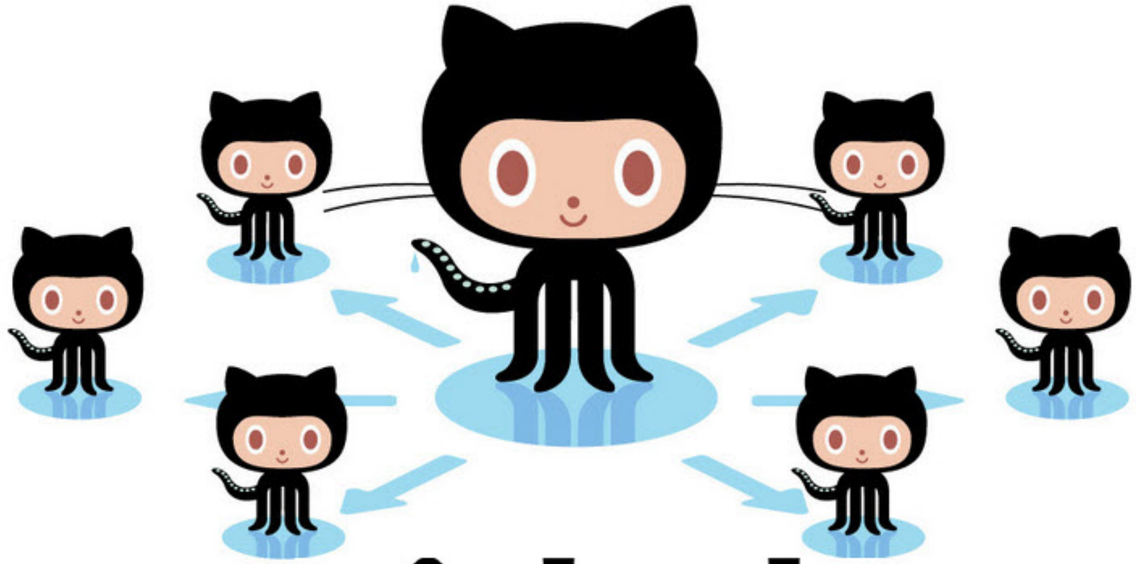
https://youtu.be/FPHYAFcUziA

Teaching in the open

- Open development, on GitHub
- Jupyter for teaching: go.gwu.edu/jupyter4edu
- Publish learning objects—digital materials can be made to be *reused*.

Open-source licenses:

People can **coordinate** their work freely, within the confines of copyright law, while making access and wide distribution a priority.



github
SOCIAL CODING

I’m reviewing this PR.

GitHub
Issues

Why Open Education?

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

Openness

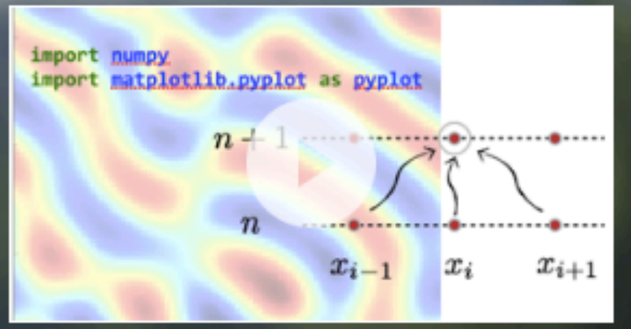
...serves a pedagogical purpose: learning is richer by open sharing.

Coordination

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

Practical Numerical Methods with Python

MAE 6286



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numerical-mooc / numerical-mooc Public

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Code | Issues 3 | Pull requests 3 | Actions | Projects | Wiki | Security | Insights | Settings

master | 6 branches | 0 tags | Go to file | Add file | Code

mesnardo Minor changes ... c2c22c8 on Dec 22, 2019 **1,148** commits

files	add downloadable copy of Ian Hawke's notes	8 years ago
lessons	Minor changes	3 years ago
styles	[L1-1] Revise Python script and adapt Notebook	4 years ago
.gitignore	Ignore Python cached files; delete extra gitignores; delete unused ...	4 years ago
LICENSE	Update LICENSE	8 years ago
README.md	Correct spelling of "Sciences"	4 years ago
nm_python_env.yaml	add scipy to conda env file. whoops...	7 years ago

README.md

Practical Numerical Methods with Python

About

A course in numerical methods with Python for engineers and scientists: currently 5 learning modules, with student assignments.

openedx.seas.gwu.edu

Readme

View license

766 stars

109 watching

1.5k forks

Releases

No releases published

Create a new release

#scipy2014 keynote @LorenaABarba says "IPython Notebooks are the Killer App for teaching (science and engineering)."

katy huff @katyhuff
10:36am - 8 Jul 2014

The killer app: Jupyter

A new genre of open educational resources (OER).

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

EngineersCode

A collection of learning modules in engineering computations

Overview | Repositories 16 | Projects | Packages | Teams | People 5 | Settings

README.md

Engineering Computations

> A collection of learning modules on computing for engineering and science students

Project lead: Prof. Lorena A. Barba

Professor Barba developed a two-course series in engineering computations at the George Washington University (courses MAE-1117 and MAE-2117). The materials for those courses are written in a modular fashion, and consist of five self-contained modules that can be individually adopted by other instructors. This GitHub organization hosts the original modules in engineering computations, plus new work-in-progress advanced modules.

Start here: https://github.com/engineersCode/EngComp

https://github.com/engineersCode

The Journal of Open Source Education

An **educator-friendly** journal for publishing computational learning modules and educational software.

Notice: We are not yet accepting submissions. Please follow our development on GitHub or Twitter.

Volunteer to review for JOSE!

Learn more »

How to develop lessons:

1. Break it down into small steps
2. Chunk small steps into bigger steps
3. Add narrative and connect
4. Link out to documentation
5. Interleave easy exercises
6. Spice with challenge questions/tasks
7. Publish openly online!

JOSE scope

What do you mean by "open-source educational materials"?

Examples include Jupyter notebooks or plaintext/markup language documents like LaTeX, R Markdown, and ReST for course/lesson content and associated notes, with embedded or associated code snippets/programs.

We do **not** mean openly available slides, lecture notes, or YouTube videos, though these may be acceptable as supplementary materials. In addition, course syllabi by themselves are not suitable for submission (*Syllabus* may be more appropriate).

tl;dr: your course or lesson content must contain or use code to teach. We are not focused exclusively on learning to code, but coding to learn.

What do you mean by "educational software tools"?

Open-source software that serves as educational technology; examples include (but are not limited to) alternatives to learning management systems, autograders, cloud systems for lesson delivery, student collaboration tools. For these tools, peer review will follow a similar process as JOSS.

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