How I (try to) engage students in the classroom

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Overview

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About me

- From Siena, Tuscany, Italy
- B.S. and M.Sc. in Mathematical Sciences at the University of Siena
- Exchange program + Ph.D. program in Applied Math at NJIT, Newark, NJ
- Postdoc in the Computer Science Department at the University of Colorado at Boulder, supervised by Jed Brown
- Research Software Engineer (3+ years) at Caltech in the CliMA project
- 1-st year Assistant Professor at SDSU

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NJIT

University of Colorado Boulder

Caltech

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Interest in teaching

- Math education was one of my favorite classes in undergrad, although my career path took other directions. Mostly interested in the cognitive processes when learning about math, logic, and geometry.
- As a postdoc, took the Center for the Integration of Research, Teaching and Learning (CIRTL) Evidence-Based Introduction to Teaching course that got me even more interested in *active learning*.
- But really learned a ton from my postdoc supervisor, Prof. Jed Brown (CU Boulder) especially for the computational tools and frameworks used.
- Kept myself active by organizing and giving workshops/tutorials, even in 100% research positions.

The CIRTL Network

The Center for the Integration of Research, Teaching and Learning

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What I teach

For the Computational Science Research Center, at San Diego State University:

- Fall 24 - Comp 526: *Computational Methods for Scientists*. Class size: 12
- Spring 25 - Comp 605: *Scientific Computing*. Class size: 20

Audience:

- 45%: PhD students in Computational Science
- 45%: MSc students in Computational Science (multiple tracks)
- 10%: undergrad

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Tools I used

- Canvas is the Learning Management System at SDSU. I mainly use it for announcements and grade book keeping
- A public website for class materials, built with Jupyter Book
- Jupyter Notebooks for in-class presentations: a mix of lectures and hands-on live demos
- Google Forms, for Background Assessment Survey and Mid-term Feedback Survey
- PollEverywhere, for live trivia/quizzes in class
- GitHub Classroom for Assignments and Reviews

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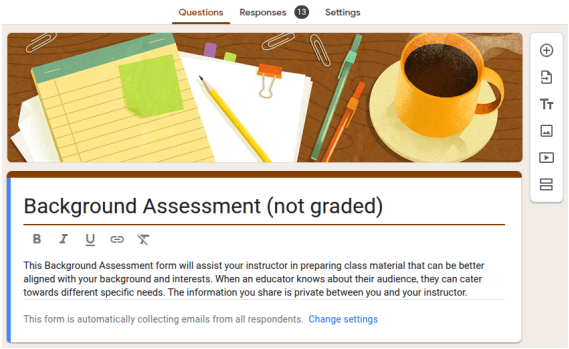
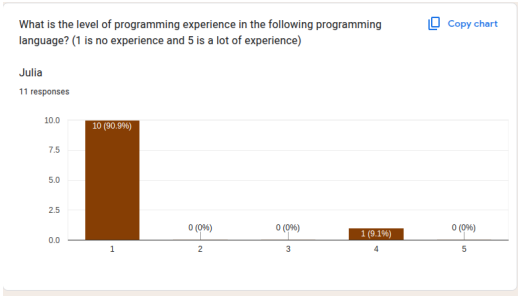
Background Assessment Survey

I asked students a few questions about their prior knowledge on some topics, such as programming languages, version control, etc



Background Assessment Survey (cont'd)



Sample of questions from Fall 24:

- What are your main academic interests?
- Do you have any concerns or questions about the upcoming school year?
- What are your thoughts on collaboration? Do you think it's important, or do you prefer to work independently?

Things I wish I'd asked (and I did this Spring semester):

- Do you have any other major commitments outside of school (e.g., work, taking care of family members, etc)?

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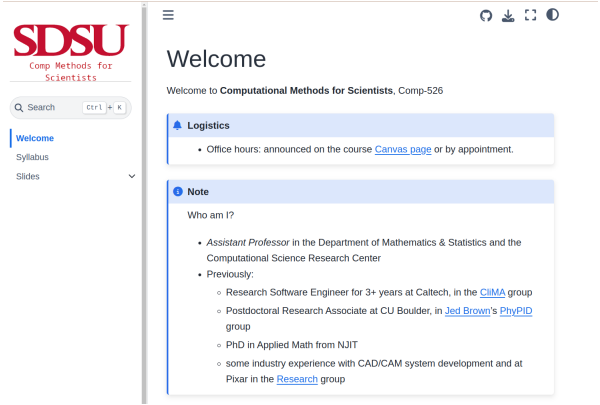
Course website and live demos

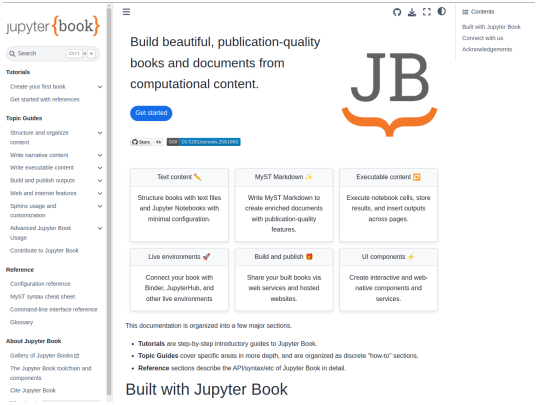
Examples of the Fall 24 course website pages:

- Home
- Syllabus
- SVD
- Splines interpolation



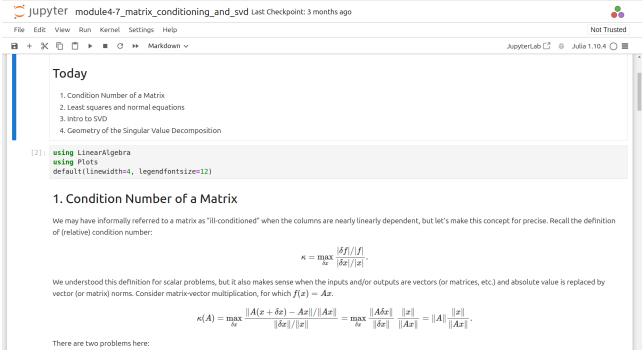
Course website tools

The course website is built and deployed/published with Jupyter Book.



Live demos tools

In-class live demos are done using Jupyter Notebooks, mainly with Julia.



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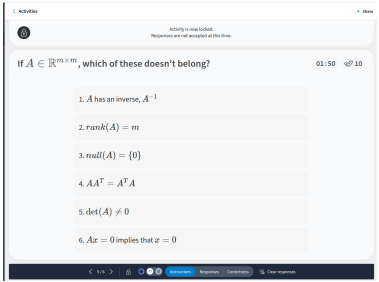
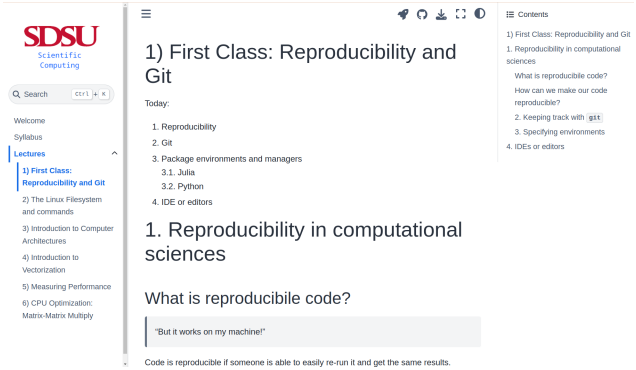
Activities



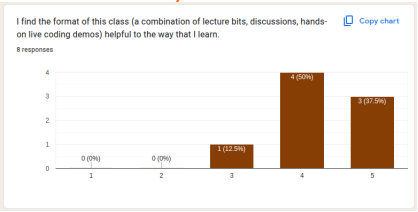
- PollEverywhere for in-class trivia
- In-class reading and discussion

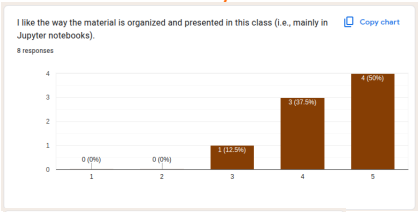
Projects

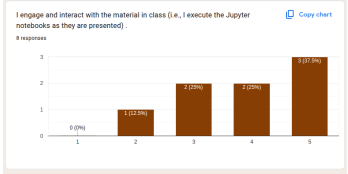


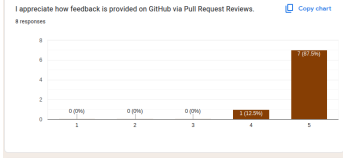
Because I care so much about reproducible and open science (which includes open-source software), I ask students to make a contribution to an open-source software project of their choice as Final Project.

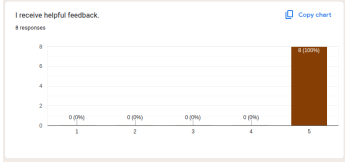
How did I do? Anonymous Midterm Feedback Survey





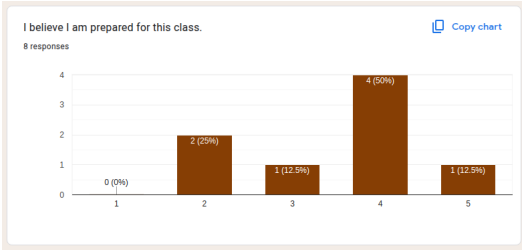


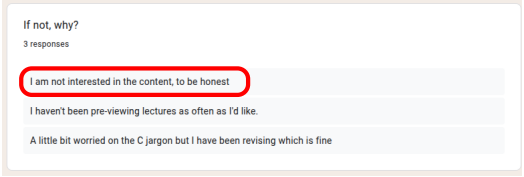


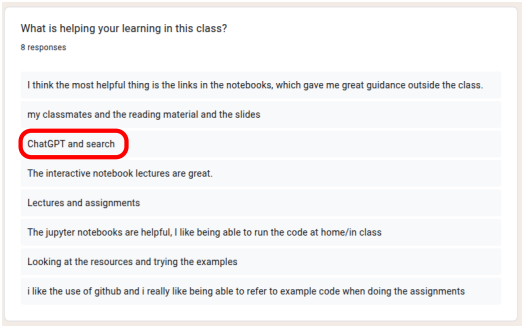


How did I do? Anonymous Midterm Feedback Survey (cont'd)

Things I was not prepared for:

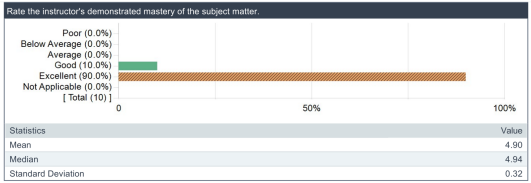




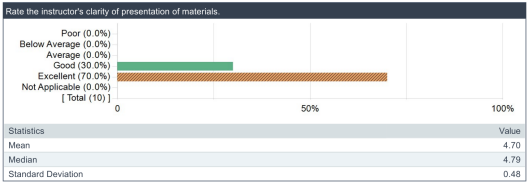


How did I do? Official Anonymous Student Feedback Surveys Fall 2024

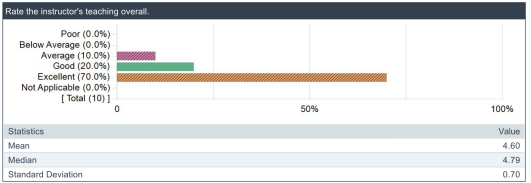
COMP526-01: Computational Methods for Scientists Valeria Barra



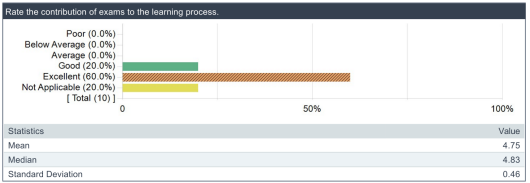
Statistics	Value
Mean	4.90
Median	4.94
Standard Deviation	0.32



Statistics	Value
Mean	4.70
Median	4.79
Standard Deviation	0.48



Statistics	Value
Mean	4.60
Median	4.79
Standard Deviation	0.70



Statistics	Value
Mean	4.75
Median	4.83
Standard Deviation	0.46

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Observations and Conclusions

- Some tools used, e.g., GitHub Classroom for assignments, do not scale for large classes and requires a lot of manual intervention for reviews/grading (unless you setup autograder for easy problems).
- Things I wish went better: **Class participation**. 
- I hope I made them feel that their feedback/voice matters.
- This was **very time consuming**. Hopefully, I will be able to reuse most of the infrastructure/content next time I teach the same class.
- Things to be careful about: Will remove solutions to the homework assignments from the public website, but they could be downloaded already.
- Suggestions/Feedback will be much appreciated!

Thank you!

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