Welcome to PH 366: Computational Physics Lab II

6 Jan 2025

Your Instructors

Patti Hamerski (Prof)

Vincent Vaughn-Uding (LA)

Mateo Hall (LA)

Kyle Gourlie (LA)

Austin Erickson (official unofficial LA)

Pachi Her (graduate researcher, not an instructor)

About Us

Prof. Patti Hamerski (she/her)

Physics education researcher

My research interests:

- Intersections of computational physics education, generative AI, and creativity
- Improving transfer pathways in the physics department
- Transgender STEM graduate student experiences

I love to explore the surrounding area with my dog, Pamela

About U

Vincent Vaugh

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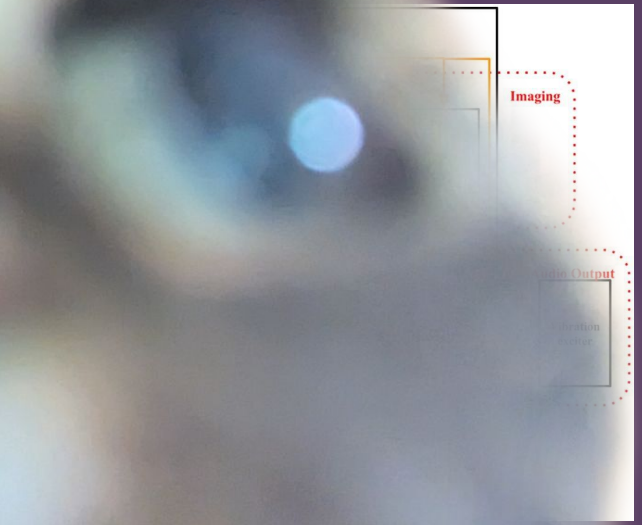
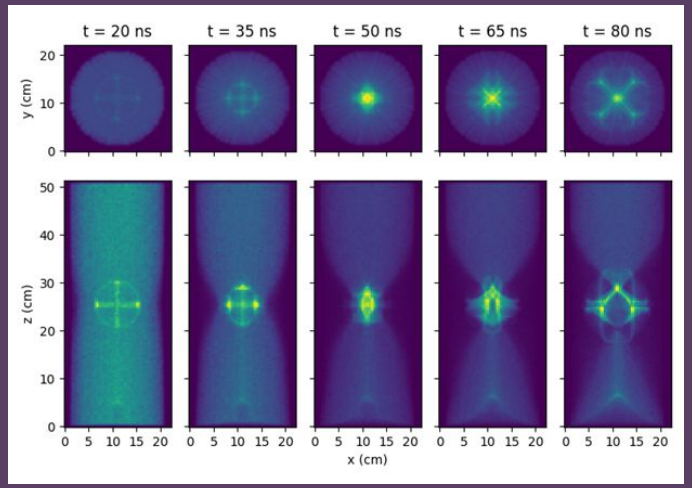
- Incoher

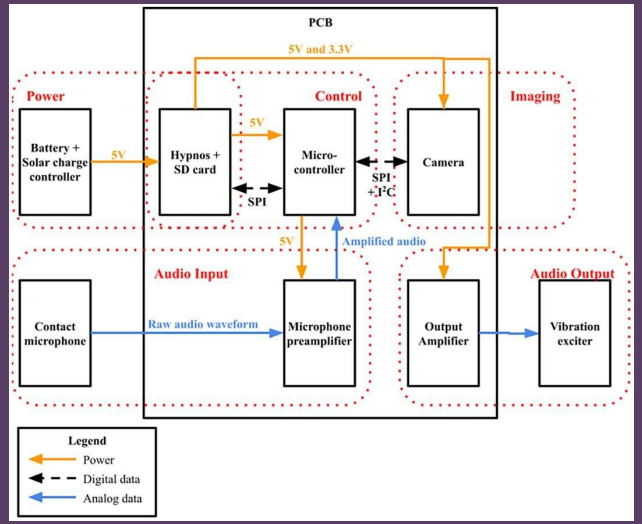


About Us

Vincent Vaughn-Uding (He/him)

- *[n + 1]* year physics, mechanical engineering student
- Incoherent research & career history





About Us

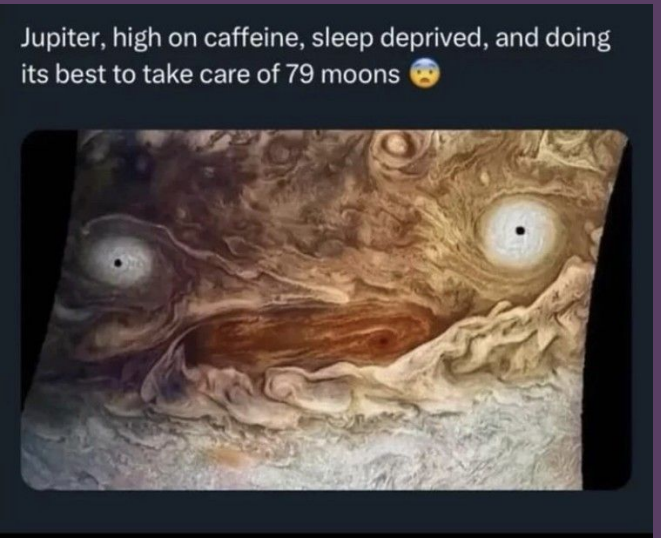
Mateo Hall (he/him), Senior Physics Major

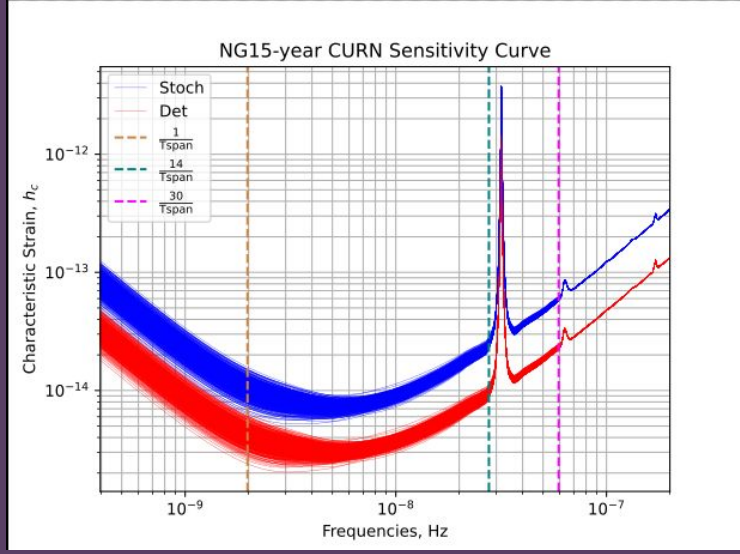
Things I like:

- Space
- Star Wars
- Pokemon
- Traveling
- Friends and Family

About Us

Kyle Gourlie (he/him)





- Research in PTA detector characterization w/ Jeff.
- Enjoy hiking and spending time with friends.
- Attempting to learn guitar again.

About Us

Austin Erickson

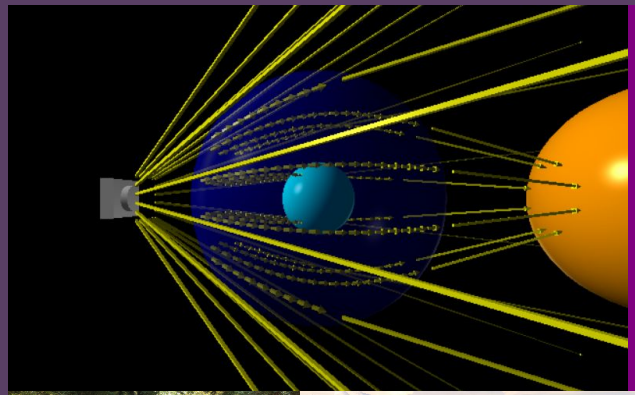
B.S. Physics

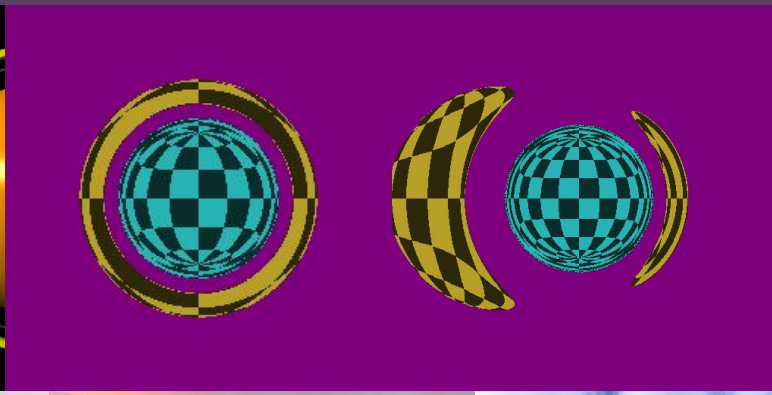
Interests:

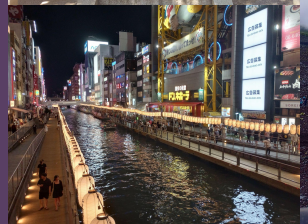
General Relativity

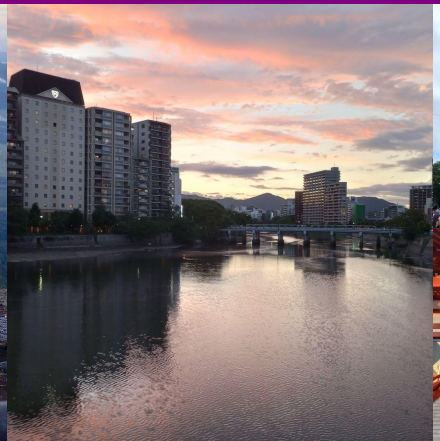
Programming

Japan





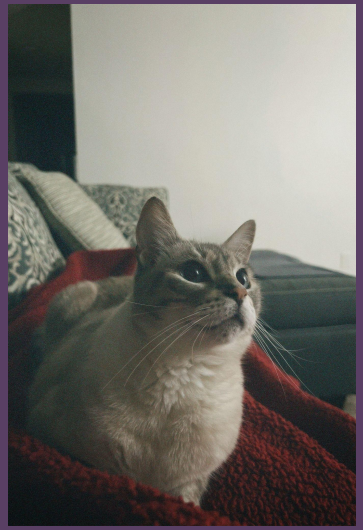




About Us

Pachi Her

- Pronouns: she/her
- Cat mom but on the side, 3rd Year PhD student
- Physics Education Research
  - Creativity, generative AI in computational physics
  - How is creativity operationalized in physics? How does it look like in computational physics? Is gen-AI creative? Does using gen-AI limit or enhance creativity?
- Interests outside of school:
  - Golf, pickleball, board games, baking



Class Meeting and Office Hours

Mon/Wed in Weniger 328 at 2:00-3:20pm

Office Hours by appointment, virtually or in-person (Weniger 485)

- Scheduling link: https://calendly.com/hamerski
- Or email me: patti.hamerski@oregonstate.edu

Learning Goals in PH 366

1. Build conceptual knowledge of algorithms and numerical methods commonly used in physics
2. Apply numerical methods to physics problems using computing tools in Python
3. Compare and analyze the precision, efficiency, and effectiveness of different computational approaches for solving physics problems
4. Create computational models of physics phenomena using intermediate data visualization tools
5. Apply statistics and modeling principles to data sets and use findings to draw insights about physics phenomena
6. Communally develop best practices for writing code, sharing it with peers, and using external resources

Course Activities

In-class participation *(and that's it! no work outside of class)*

- Bring your laptop (if you have one; otherwise we have several classroom computers)
- Active learning classroom (group work)
- Designing, creating, altering, discussing, and sharing solutions to computing and physics problems
- Working together to problem-solve
- Reporting out on challenges and learning

Our collective experience and what we all learn relies on you

Assessment Breakdown

50% — Participation, attendance, and daily assignments

20% — Midterm mini-project

- 2-day project during Week 5 class periods
- More open-ended, complex version of daily assignments
- Collaboration allowed, but submit your own **individual** work

30% — Final project and presentation

- 3-day **group** project in Weeks 9 and 10
- 2 days working, 1 day presenting
- More choice/creativity allowed in the project topic
- Requires synthesizing different concepts/tools from the course

Late Policy

All deadlines posted on Canvas

Late penalty is **20%**

Assignments get **no credit** if they are **missed**, meaning:

- Daily assignments not handed in within 48 hours late
- Projects not handed in within 4 days late

Exceptions only permitted when discussed **before** due date

Generative AI Usage

Use of generative AI is allowed in this course, and at times may be required. Generative AI is not inherently bad, but it can be used carelessly without considering **how** you're using it. Whenever you use it…

Describe how you used it:

- Getting a different perspective on a new concept to help you understand it better
- Brainstorming how to convert an idea into code
- Taking code or an explanation from a gen-AI output, and making it your own through significant changes
- Using explanations and/or code directly with minimal editing

AND provide an attribution:

- What prompt(s) did you use to get a helpful output?
- If exploring a concept brainstorming, how did the generative AI output change your perspective?
- If using code/explanations directly, what parts did you alter, and why?

Inclusive Classroom Environment

Our collective experience and what we all learn relies on you and me

You are:

- a student
- a peer to your classmates
- a member of the OSU community
- a person

I am:

- an instructor
- a member of the OSU community
- a person

Rest of the Syllabus

…can be found on Canvas

Please read, and direct any questions to Patti!

Plan for Today

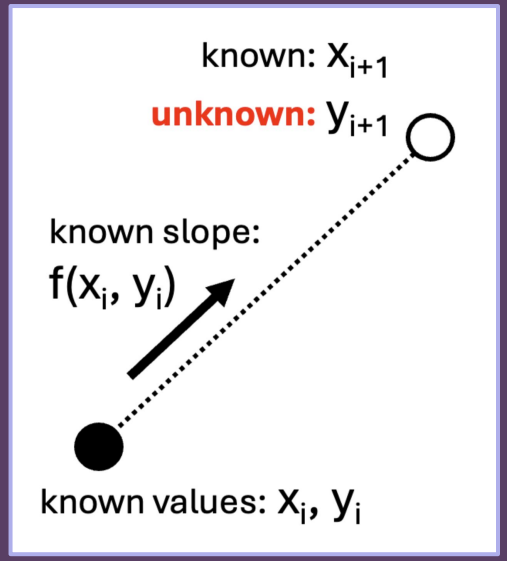
1. Double check your software is working, and troubleshoot if needed
2. Do the first in-class assignment — a review on using loops in the Euler method
3. Complete **two** surveys at the end of the assignment

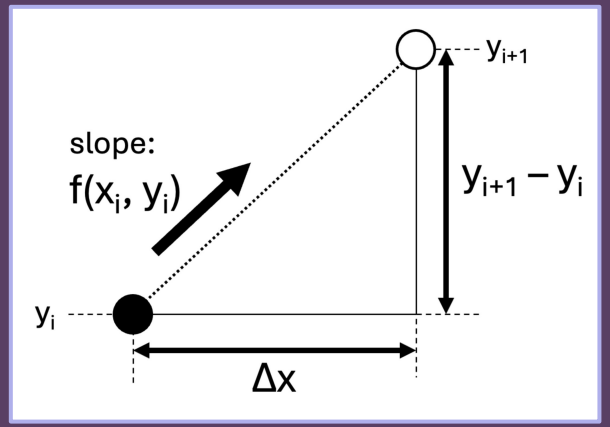
Two Surveys

Fill out the two surveys in order to get credit for participating today.

1. **Get-to-know-you survey** to help your instructors better understand your background.
2. **Research consent form** — Research may be conducted on the activities in PH 366 this term. Data will be collected on an opt-in basis. Nevertheless, you must fill out the form to indicate your opt-in status. Your instructor will not be able to see your response or see any data collected this term, but they will be able to see whether you filled out the form.

Review of the Euler method





$$y_{i+1} = y_i + f(x_i, y_i)\,\Delta x$$

Review of the Euler method

```
dxdy = known function
x0 = known value
y0 = known value
dx = known value

y1 = y0 + dxdy(x0, y0) * dx
x1 = x0 + dx

y2 = y1 + dxdy(x1, y1) * dx
x2 = x1 + dx

...
```

$$y_{i+1} = y_i + f(x_i, y_i)\,\Delta x$$