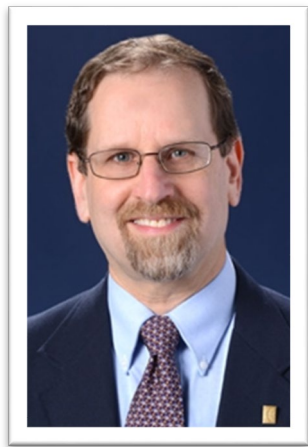


GETTING STARTED: COMPUTER SCIENCE INDEPENDENT WORK

SPRING 2023

DR. ROB FISH, Dr. XIAOYAN LI, MIKKI HORNSTEIN

WELCOME!



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OUTLINE FOR THIS SESSION

- Outstanding IW Awards – Fall 2022
- Overview of independent work in Computer Science
- Details of important steps and deadlines
- Resources for more information and help



CONGRATULATIONS!

Fall 2022 Outstanding Independent Work

Viki Mancoridis

A Physics-Constrained Deep Learning Investigation of Wind-Wave Interactions

Adviser: Michael Mueller

Allison Qi

A Private NFT Marketplace on Ethereum

Adviser: Ran Raz

Autumn Tan

Assembly Visualizer: Breaking Down ARM Assembly

Adviser: Robert Fish

Owen Travis

Go With Your Gut? Determining the Value of Computation in the Game of Go

Adviser: Tom Griffiths





**LET'S GET
STARTED!**



What Is Independent Work?

■ Independent Work (IW):

An individual project to study an idea in depth.

■ Examples:

- ▷ Algorithm
- ▷ System design
- ▷ Problem formulation
- ▷ Benchmark suite
- ▷ Proof of a theorem
- ▷ Application
- ▷ Investigate a dataset
- ▷ Etc...



Why Do Independent Work?

- Study a topic in depth
 - ▷ Dive into much more detail than is possible in a course
- Learn important skills
 - ▷ Technical writing, speaking, project management
- Work closely with faculty
 - ▷ Meet weekly, get advice, get to know them, etc.
- Do something interesting to talk about in...
 - ▷ Grad applications, job interviews, etc.
- Have fun!!



Types of Independent Work

■ Spring One-Term Project

- ▶ All AB juniors and some BSE juniors/seniors
- ▶ Designed for one term, but can be followed by a related project in a later term
- ▶ IW seminar, or one-on-one/individual advising

■ Two-Term/Thesis

- ▶ All AB seniors and some BSE juniors/seniors
- ▶ Designed for a full year
- ▶ One-on-one/individual advising



IW Seminars

- Same as one-on-one projects, but students work on related topics and meet with an advisor together.
 - ▶ Enables collaborative projects
 - ▶ Enables sharing of infrastructure
 - ▶ Enables feedback to/from other students
- Targeted at first-time IW students
 - ▶ Provides more help on how to choose good projects, how to manage time, how to design talks, how to write papers, etc.



Important Steps and Deadlines: Spring 2023 Projects

- February 17: SEAS Funding Application due, 11:59pm
- February 20: Written Project Proposal due, 11:59pm
- March 11: Checkpoint Form due, 11:59pm
- March 28: Attend How to Give an IW Talk
- April 14: Attend How to Write an IW Paper
- April 16: Oral Presentation Slides & Link to Video due, 11:59pm
- May 1: Written Final Report due, 11:59pm

<https://www.cs.princeton.edu/ugrad/independent-work/important-steps-and-deadlines>

QUESTIONS SO FAR?



**Onto the
specifics...**



Written Project Proposals

- Submit a written description of your project plan
- Logistics:
 - ▷ Due February 20, 11:59pm Eastern
 - ▷ 1-2 page paper
 - ▷ Submit PDF document via IW portal



Written Project Proposal (Continued)

■ Motivation and goal

- ▷ “The goal of my project is...”

■ Related work

- ▷ Survey of prior work with similar goals

■ Approach

- ▷ Key novel idea

■ Implementation plan

- ▷ Things you plan to implement

■ Evaluation Plan

- ▷ Experiment design, data, metrics, comparisons



Checkpoint Form

- Write a short summary of what is done in the first half, and what is planned for the second half
- Logistics:
 - ▷ Due March 11, 11:59pm EDT
 - ▷ Write two paragraphs
 - ▷ Submit via IW portal
 - ▷ Get feedback from advisor

Checkpoint Form - Comp. X

https://iw.cs.princeton.edu/portal/student/submissions/229/checkpoint

Checkpoint Form

Please refer to [independent work website](#) for more information about this form.

Name*

Advisor*

Project title*

Approximate number of meetings with your advisor*

Progress report*

Progress to date: ← **Progress to date:**

Current difficulties: ← **Current difficulties:**

Next steps: ← **Next steps:**

Submit



Oral Presentation

- Give a **nine-minute** talk about what you've done over the whole semester
 - ▷ Required for all seminar students, and any first-time BSE students.
- Logistics:
 - ▷ Attend “How to Give an IW Talk” on March 28
 - ▷ Submit slides and video link via IW portal by April 16 at 11:59pm
 - ▷ Note: You must submit your FULL slide deck by the deadline above

Oral Presentation (Continued)

- Video-recorded oral presentations
 - ▷ Record your oral presentation via Zoom, or
 - ▷ Select another way to record your oral presentation (Loom, etc.)
- Save your recording either on Zoom or in Google Drive
 - ▷ Submit a **link** to your recording to the IW portal
- Submit a pdf of your slides to the IW portal
- Seminar students: your instructor may ask you to practice or present in your group meeting, as well
- One-on-one students: your adviser may ask you to present to their research group, as well

Oral Presentation (Continued)

- Motivation and goal
 - ▷ “The goal of my project is...”
- Related work
 - ▷ Survey of prior work with similar goals
- Approach
 - ▷ Key novel idea
- Implementation plan
 - ▷ Things you implemented. How did you do it? What remains to be done?
- Evaluation
 - ▷ Experiment design, data, metrics, comparisons, qualitative results, quantitative results, further results needed
- Discussion
 - ▷ Conclusions, limitations, future work



Written Final Report

- Submit a written description of your project, including results and conclusions

Logistics

- Due May 1 by 11:59pm
- Attend “How to Write an IW Paper” on April 14
- Submit PDF via IW portal
- 20-25 pages, double-spaced, plus appendix
- **Final papers submitted after 11:59pm on the due date will be assigned a 1/3 grade deduction.**



Written Final Report (Continued)

Motivation and goal

- ▷ “The goal of my project is...”

Related work

- ▷ Survey of prior work with similar goals

Approach

- ▷ Key novel idea

Implementation

- ▷ Things you built. How did you do it? ~~What remains to be done?~~

Evaluation

- ▷ Experiment design, data, metrics, comparisons, qualitative results, quantitative results, ~~further results needed~~


Discussion

- ▷ Conclusions, limitations, future work

Additional Important Information

<https://iw.cs.princeton.edu/portal>

Manage your independent work

Spring 2023	
Project Title	<input type="text"/> (Edit)
Advisor	August, David
Written Proposal Due: 2/20/2023 11:59 pm	Submit File 
Checkpoint Form Due: 2023-03-11	Click to complete form
Oral Presentation Due: 4/16/2023 11:59 pm	Submit File
Oral Presentation Video Link Due: 4/16/2023 11:59 pm	Click to complete form
Written Final Report Due: 5/1/2023 11:59 pm	Submit File



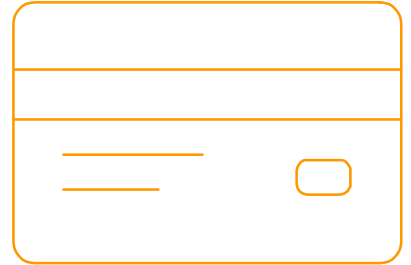
Funding

■ Project-related expenses:

- ▶ Unusual hardware, software, data sets, etc.

■ Available funds:

- ▶ School of Engineering and Applied Science
 - ▶ Requires an adviser signature, **don't procrastinate!**
 - ▶ Support up to ~\$500 or more with justification (\$300 max for cloud computing services)
 - ▶ Open to ANY computer science student
- ▶ Student Activities Funding Engine (SAFE)
 - ▶ <http://www.princeton.edu/studentfunding>





Collaboration

■ INDEPENDENT Work

- ▶ Every student must do their own project

■ Collaboration

- ▶ Multiple IW projects can be synergistically part of a larger effort, either with other IW students, or grad students
- ▶ Each student must carve out a distinct part with a clear goal, novel idea, evaluation methodology, etc.
- ▶ Each student must submit their own work
- ▶ Each student will be graded separately



Grading

- IW must be taken for a grade
- Grades are recommended by instructor, confirmed by IW Coordinators

- Grades will depend upon:
 - ▶ Student initiative and contribution: the creativity and originality of student ideas and/or degree of technical challenge undertaken
 - ▶ Student progress: content, amount of work accomplished to date, clarity and polish of presentations
 - ▶ Student presentation and paper: content, eloquence, organization and clarity



Grading (Continued)

- Majority of grade will depend upon quality of work
 - ▶ But, poor presentation and/or missing checkpoints will also have an impact
- **Final papers submitted after 11:59pm on the due date will be assigned a 1/3 grade deduction.**



Grading (Continued)

A-level

- ▶ Clear contribution – interesting, creative
- ▶ Solid execution and results – refined and tested
- ▶ Excellent talks, papers – thoughtful, thorough
- ▶ Student has taken initiative and led project

B-level

- ▶ Not-so-innovative – possibly obvious from previous work
- ▶ Working execution and results – not fully refined and tested
- ▶ Complete papers and talks – limited insights



Grading (Continued)

■ C-level

- ▶ Not innovative
- ▶ Unfinished or not working implementation
- ▶ Report looks like workbook or lab report

■ D-level

- ▶ Nothing interesting attempted, nothing gained
- ▶ Report is stream of consciousness



Common Mistakes

- ⊘ Mistake: Delaying project planning until last minute
 - ▷ Instead: Get started right away
- ⊘ Mistake: Postponing meetings with your advisor
 - ▷ Instead: Try to meet once a week, even if it's a brief meeting
- ⊘ Mistake: Allowing yourself to get stuck
 - ▷ Instead: Talk to your advisor; don't avoid them when you are stuck
 - ▷ TA's are assigned to every seminar. Use them!



Common Mistakes (Continued)

- ⊘ Mistake: Putting off work until the end of the semester
 - ▶ Instead: Work consistently during the semester (10 hours per week, minimum)

- ⊘ Mistake: Preparing papers and presentations at the last minute
 - ▶ Instead: Iteratively refine. Get feedback from your advisor.



If You're Having Trouble...

Examples:

- ▶ If you expect to miss a deadline
- ▶ If you have problems with your advisor
- ▶ If you have problems with your project
- ▶ Other factors in your life (e.g. illness, death in the family, etc.)

If you tell us early, we might be able to help you

- ▶ We can direct you to the right person

Fixing problems post facto may be much harder

- ▶ Often involves Deans, etc.

A large orange speech bubble graphic containing the text 'LET US KNOW!' in blue, bold, uppercase letters.

LET US
KNOW!



Who/What You Can Ask

■ Your Advisor:

- ▶ Anything research related
- ▶ Not: “Can I skip the project proposal or final paper?”

■ IW Coordinators (Dr. Fish, Dr. Li)

- ▶ Anything about mandatory requirements
- ▶ Not: “Is this research interesting?”

■ IW Administrator (Mikki Hornstein)

- ▶ Anything about dates, forms, funding, etc.
- ▶ Not: “Can you give me an extension?”

❓ How to Ask Questions

■ Canvas/Ed – Primary Resource

- ▶ <https://princeton.instructure.com/courses/11074>
- ▶ Ask IW staff and other students questions about logistics, advice, toolkits, data sets, etc.

■ Email Mikki

- ▶ mhornstein (@princeton.edu)



Where to Find More Information

- IW Website:

- ▶ <http://www.cs.princeton.edu/ugrad/independent-work>

- ▶ Important Steps and Deadlines

- ▶ Guidelines and Useful Information

- Note: These slides will also be available on the website and Canvas



That pretty much covers it.

Let's summarize the key points...





Immediate Next Steps

- Look over the IW website, and be aware of important upcoming deadlines
 - ▶ Important Steps and Deadlines
 - ▶ Guidelines and Useful Information
- One-on-one students: Schedule weekly meetings with your advisor



What to Do in January/February?

- Work diligently to develop your project plan
 - ▷ Work hard to define a specific goal
 - ▷ Understand all related work
 - ▷ Articulate what makes your project novel
 - ▷ Know what software and data you will use
 - ▷ Have a good idea of what you need to implement
 - ▷ Have a specific plan to evaluate your results
- Write your project proposal early, get feedback, and refine multiple times.



But the Term Just Started!

- The first few weeks are really important...
 - ▶ A good project plan is key to success
 - ▶ It takes time to understand related work, relevant software, and available data sets
 - ▶ It take iteration and refinement (multiple meetings with your advisor) to define a good project goal and novel approach
 - ▶ Working hard in the first few weeks greatly reduces the chances of ending up with a weak project



My Thoughts on IW at Princeton

- This is your chance to do an in-depth project on a novel topic of your own choosing
 - ▶ It doesn't get better than this
 - ▶ It's probably why you came to Princeton
 - ▶ It's certainly what you'll remember most from your academic career at Princeton
- Take the initiative and **BE AWESOME!**



THANKS!

Any questions?