

# GETTING STARTED: COMPUTER SCIENCE INDEPENDENT WORK

FALL 2021

DR. DAVID DOBKIN, DR. ROB FISH, MIKKI HORNSTEIN

# WELCOME!



**Robert Fish**  
**IW Coordinator**

[rfish@cs.princeton.edu](mailto:rfish@cs.princeton.edu)

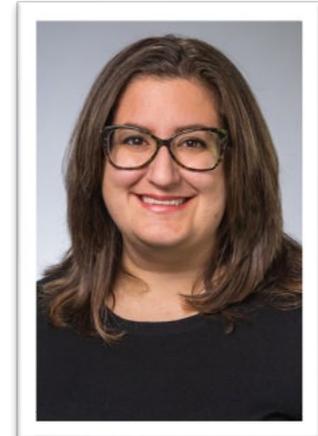
037 Corwin Hall



**David Dobkin**  
**IW Coordinator**

[dpd@cs.Princeton.edu](mailto:dpd@cs.Princeton.edu)

419 Computer Science



**Mikki Hornstein**  
**IW Administrator**

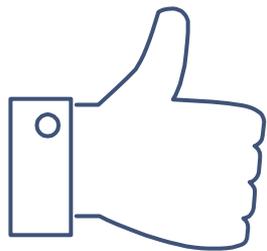
[mhornstein@princeton.edu](mailto:mhornstein@princeton.edu)

204 Computer Science



## OUTLINE FOR THIS SESSION

- Overview of independent work in Computer Science
- Details of important steps and deadlines
- Resources for more information and help



**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

### ■ Fall Term Project

- ▶ 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: Fall Term Projects

- Sept 29: SEAS Funding Application due to [BSEprogram@princeton.edu](mailto:BSEprogram@princeton.edu)
- Sept 23: Written Project Proposal due in IW portal, 11:59pm EDT
- Oct 16: Checkpoint Form due in IW portal, 11:59pm EDT
- Nov 2: Attend How to Give an IW Talk, via Zoom
- Nov 30: Attend How to Write an IW Paper, via Zoom
- Dec 5: Oral Presentation Slides & Link to Video due in IW portal, 11:59pm EST
- Jan 10: Written Final Report due in IW portal, 11:59pm EST

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



## Important Steps and Deadlines: Two Term/Thesis Projects, Fall 2021

- Sept 29: SEAS Funding Application due to [BSEprogram@princeton.edu](mailto:BSEprogram@princeton.edu)
- Sept 23: Written Project Proposal due in IW portal, 11:59pm EDT
- Oct 16: Checkpoint Form due in IW portal, 11:59pm EDT
- Nov 30: Attend How to Write an IW Paper, via Zoom
- Dec 7: Progress Report Form due in IW portal, 11:59pm EST

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



## Important Steps and Deadlines: Two-Term/Thesis Projects, Spring 2022

- Feb 11: SEAS Funding Application due to [BSEprogram@princeton.edu](mailto:BSEprogram@princeton.edu)
- Feb 22: Written Draft Paper due in IW portal, 11:59pm EST
- March 21: Second Reader due in IW portal, 11:59pm EST
- TBD: Attend How to Give an IW Talk (usually late March)
- April 11: Written Final Report due in IW Portal, 11:59pm EDT
- April 18: Oral Presentation Slides due in IW Portal, 11:59pm EDT
- April 18-22: Oral Presentation Week (schedule a time with your adviser to give a live oral presentation)

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

# QUESTIONS SO FAR?



Onto the specifics...



## Written Project Proposals (All IW Students)

- Submit a written description of your project plan
- Logistics:
  - ▶ Due September 23, 11:59pm EDT
  - ▶ 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 (All IW Students)

- Write a short summary of what is done in the first half, and what is planned for the second half
- Logistics:
  - ▷ Due October 16, 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 (Fall-Term Students, Only)

- 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 doing a Fall one-on-one project.
- Logistics:
  - ▷ Attend “How to Give an IW Talk” on November 2 via zoom
  - ▷ Submit slides and video link via IW portal by December 5 at 11:59pm EST.
    - ▷ Note: You must submit your FULL slide deck by the deadline above.



## Oral Presentation (Fall-Term Students, Only), Continued...

- NEW as of Spring 2021: recorded oral presentations
  - ▷ Record your oral presentation via Zoom, or
  - ▷ Record audio over your PowerPoint slides, or
  - ▷ Select another way to record your oral presentation
- 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 (One-Term Students, Only), 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 (All IW Students)

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

### One-Term Projects

- Due January 10 by 11:59pm EST
- Attend “How to Write an IW Paper” on November 30 via zoom
- Submit PDF via IW portal
- 20-25 pages, double-spaced, plus appendix

### Two-Term/Thesis Projects

- Due April 11 by 11:59pm EDT
- Attend “How to Write an IW Paper” on November 30 via Zoom
- Submit PDF via IW portal
- 40-50 pages, double-spaced, plus appendix



## 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 Requirements for Two-Term/Thesis Students



## Second Reader Form (Thesis Students Only)

- Select a member of the Princeton faculty to be a second reader on your project
  - ▶ Second readers review your project and provide input on your grade
- Logistics:
  - ▶ Due in IW portal on March 21 by 11:59pm EDT
    - ▶ Start asking early!

# Second Reader Form

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

**Name\***

**Advisor\***

**Project title\***

**Who will be your second reader?**

Note that your second reader will receive an email letting them know you selected them.

My second reader is not listed above

I confirm that my second reader has agreed to be a second reader for my thesis (you must get confirmation before submitting this form)

Submit

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



## Draft Paper (Two-Term/Thesis Students, Only)

- Submit a draft for at least the first few sections of your written report
- Logistics:
  - ▷ Due February 22 by 11:59pm EST
  - ▷ At least 4-5 pages, single spaced
  - ▷ Submit PDF via IW portal



## Spring Oral Presentation (Two-Term/Thesis Students, Only)

- Give a 12-minute talk about what you've achieved over the course of the year
  - ▷ Required for all thesis students and all first-time BSE students.
- Logistics:
  - ▷ Slides due in IW portal on April 18, 11:59pm EDT
    - ▷ Oral Presentations Week, April 18-22
    - ▷ Set up a time to present live (in-person or via Zoom) to your adviser. If your adviser is outside of the COS department, schedule a time to present to one of the IW Coordinators.



## Spring Oral Presentation (Two-Term/Thesis Students, Only) Continued...

### More Logistics:

- ▶ Counts as Senior Departmental Exam for AB Seniors
- ▶ Attend “How to Give an IW Talk” on November 2 at 5:00pm EDT or in the Spring (late March)
- ▶ Utilize campus resources such as McGraw Center and Princeton Writes



## Spring In-Person Oral Presentation (Two-Term/Thesis Students, Only), 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 you did 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>

This website is used to collect required form submissions and track your Dropbox submissions for your independent work with the Computer Science Department.

Please review the [independent work important dates and deadlines](#) if you have not yet done so. This page details the specific dates the various assignments and forms are due.

### Spring IW Sign-Up

Please complete the sign-up form for the Spring semester if you have not done so already.

[▶ Click to complete form.](#)

## Manage your independent work

### Fall 2019

<b>Advisor</b>	Fish, Rob
<b>Written Proposal</b>	✓ Submitted
<b>Checkpoint Form</b>	✓ Submitted ( <a href="#">View Feedback</a> )
<b>Oral Presentation Slides</b>	✓ Submitted ( <a href="#">View Feedback</a> )
<b>Written Final Report</b>	✓ Submitted
<b>Poster</b>	✓ Submitted ( <a href="#">View Feedback</a> )



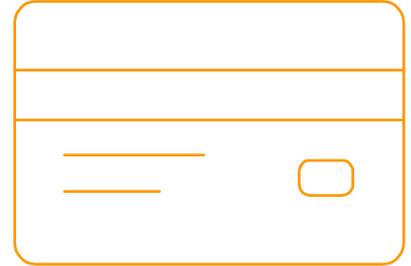
# Funding

## Project-related expenses:

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

## Available funds:

- ▶ School of Engineering and Applied Science
  - ▶ Application has been emailed to you by SEAS already!
    - ▶ Requires an adviser signature, don't procrastinate!
  - ▶ Support up to ~\$500 (\$300 max for cloud computing services – MS Azure)
  - ▶ 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 this semester, no P/D/F
- Grades will depend upon:
  - ▷ Student initiative and contribution: the creativity and originality of student ideas
  - ▷ Student progress: content, amount of work accomplished to date, clarity and polish of presentations
  - ▷ Student presentation and paper: content, eloquence, organization and clarity
- Majority of grade will depend upon quality of work
  - ▷ But, poor presentation and/or missing checkpoints will also have an impact



## 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, talks, and posters – 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 many seminars. 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.

**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. Dobkin)

- ▶ 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://edstem.org/us/courses/12973/>
- ▶ Ask IW staff and other students questions about logistics, advice, toolkits, data sets, etc.
- ▶ We will send announcement when student data upload is complete.



## 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 September?

- 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 god 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?