GETTING STARTED: COMPUTER SCIENCE INDEPENDENT WORK
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

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>February 17</td>
<td>SEAS Funding Application due, 11:59pm</td>
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<tr>
<td>February 20</td>
<td>Written Project Proposal due, 11:59pm</td>
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<td>March 11</td>
<td>Checkpoint Form due, 11:59pm</td>
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<td>March 28</td>
<td>Attend How to Give an IW Talk</td>
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<td>April 14</td>
<td>Attend How to Write an IW Paper</td>
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<td>April 16</td>
<td>Oral Presentation Slides &amp; Link to Video due, 11:59pm</td>
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<td>May 1</td>
<td>Written Final Report due, 11:59pm</td>
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QUESTIONS SO FAR?
Onto the specifics...
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
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
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
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
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
https://iw.cs.princeton.edu/portal
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
**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
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.

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 takes 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
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?