GETTING STARTED: COMPUTER SCIENCE INDEPENDENT WORK
WELCOME!

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OUTLINE FOR THIS SESSION

- Outstanding IW Awards – Spring 2023
- Overview of independent work in Computer Science
- Details of important steps and deadlines
- Resources for more information and help
CONGRATULATIONS!

Spring 2023 Outstanding Independent Work

Sarah Bock
Using Domain Adversarial Neural Networks (DANN) to Reduce Human Bias in Classification Algorithms
Adviser: Olga Russakovsky

Ananya Grover
Studying the Impact of "Rhythm Bots" on Human Motion, Emotional Valence and Arousal, and Brainwave Entrainment
Adviser: Naomi Leondard

Michelle Huang
Improving Language Model Consistency through Sparsity Activation Regularization
Adviser: Suma Bhat

Saumya Malik
Unsupervised Learning of Sparse Lexical Retrievers
Adviser: Danqi Chen

Archie McKenzie
Histories.ai
Adviser: Brian Kernighan

Andrew Tao
Nested Data Parallelism using Parallel Sequences in OCaml
Adviser: Andrew Appel

Marina Mancoridis
The Price Is Right, or Is It? A Data-Driven Approach to Understanding Individual Decisions Under Risk
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

- **Fall One-Semester Project**
  - Some BSE juniors/seniors
  - Designed for one term, but can be followed by a related project in a later semester
  - IW seminar, or one-on-one/individual advising

- **Two-Semester/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 2023 Projects

- September 27: Written Project Proposal due, 11:59pm
- September 28: SEAS Funding Application due
- October 25: Checkpoint Form due, 11:59pm
- November 7: Attend How to Give an IW Talk
- December 5: Attend How to Write an IW Paper
- December 10: Oral Presentation Slides & Link to Video due, 11:59pm
- January 11: Written Final Report due, 11:59pm

https://www.cs.princeton.edu/ugrad/independent-work/important-steps-and-deadlines
Important Steps and Deadlines: Two-Semester/Thesis Projects, Fall 2023

- **September 27:** Written Project Proposal due, 11:59pm
- **September 28:** SEAS Funding Application due
- **October 25:** Checkpoint Form due, 11:59pm
- **November 7:** Attend How to Give an IW Talk
- **December 5:** Attend How to Write an IW Paper
- **December 7:** Mid-Year Progress Report due, 11:59pm

February 15: SEAS Funding Application due
February 22: Written Draft Paper due, 11:59pm
February 28: Thesis Second Reader due, 11:59pm
March 26: Attend How to Give an IW Talk
April 9: Attend How to Write an IW Paper
April 18: Thesis Final Written Paper due, 11:59pm
April 21: Oral Presentation Slides due, 11:59pm
April 22-26: Oral Presentation Week (schedule a time with your adviser to give a live oral presentation)
April 28: Two-Semester Junior Written Final Report due, 11:59pm

https://www.cs.princeton.edu/ugrad/independent-work/important-steps-and-deadlines
QUESTIONS SO FAR?
Onto the specifics…
Submit a written description of your project plan

Logistics:
- Due September 27, 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
Write a short summary of what is done in the first half, and what is planned for the second half

Logistics:
- Due October 25, 11:59pm EDT
- Write two paragraphs
- Submit via IW portal
- Get feedback from advisor
Checkpoint Form

Please refer to Independent work website for more information about this form.

Name *

Advisor *
Funkhouser, Thomas

Project title *

Approximate number of meetings with your advisor *

Progress report *

Progress to date:

Current difficulties:

Next steps:

Submit
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 November 7
- Submit slides and video link via IW portal by December 10 at 11:59pm
  - Note: You must submit your **FULL** slide deck by the deadline above
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
*(All IW & Thesis Students)*

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

### Fall Semester IW
- Due January 11 by 11:59pm
- Attend “How to Write an IW Paper” on December 5
- Submit PDF via IW portal
- 20-25 pages, double-spaced, plus appendix

### Senior Thesis
- Due April 18 by 11:59pm
- Attend “How to Write an IW Paper” on December 5 or April 9
- Submit PDF via IW portal
- 40-50 pages, double-spaced, plus appendix

### Two-Semester Junior IW
- Due April 28 by 11:59pm
- Attend “How to Write an IW Paper on December 5 or April 9
- Submit via IW portal
- 40-50 pages, double-spaced, plus appendix

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*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?
  - Experiment design, data, metrics, comparisons, qualitative results, quantitative results, further results needed

- Discussion
  - Conclusions, limitations, future work
Additional Requirements for Two-Semester/Thesis Students
Submit a draft for at least the first few sections of your report and an outline for the remainder.

Logistics:

- Due February 22, 11:59pm Eastern
- At least 4-5 pages, single-spaced
- Submit PDF document via IW portal
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
- If your primary adviser is not a COS faculty member, your second reader MUST be a COS faculty member

Logistics:
- Due in IW portal on February 28, 11:59pm Eastern
  - 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
Spring Oral Presentation
(Two-Term/Thesis Students Only)

Give a live **12-minute** talk about what you’ve achieved over the course of the year

- Required for all two-semester and thesis students

**Logistics:**

- Slides due in IW portal on April 21, 11:59pm
  - Oral Presentations Week, April 22-26
  - Set up a time to present live, in-person, to your adviser.
Spring Oral Presentation, Continued
(Two-Term/Thesis Students Only)

More Logistics:

▷ Counts as Senior Departmental Exam for AB Seniors
▷ Attend “How to Give an IW Talk” on November 7 or March 26
▷ Utilize campus resources such as McGraw Center and Princeton Writes
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

Manage your independent work

<table>
<thead>
<tr>
<th>Fall 2023</th>
</tr>
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<tbody>
<tr>
<td><strong>Project Title</strong></td>
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<tr>
<td><strong>Advisor</strong></td>
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<tr>
<td>Written Proposal</td>
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<tr>
<td>Checkpoint Form</td>
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<tr>
<td>Oral Presentation</td>
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<tr>
<td>Oral Presentation Video Link</td>
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<tr>
<td>Written Final Report</td>
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</tbody>
</table>
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](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.
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!
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. Kincaid)
- 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/12708](https://princeton.instructure.com/courses/12708)
- 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:

- 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/October?

- 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.
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
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?